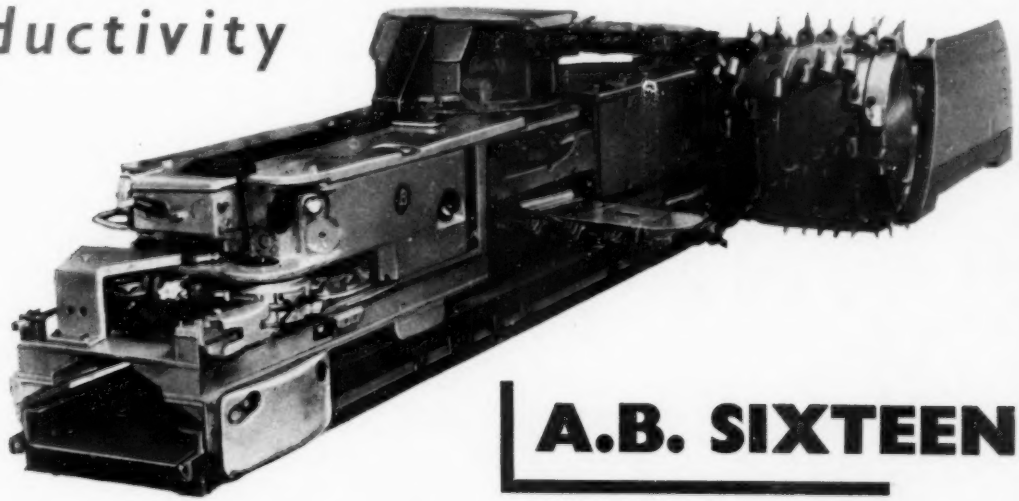
IRON & COAL

THE IRON AND COAL TRADES' REVIEW

VOL. 163 No. 4351 | Offices: John Adam House, 17-19, John Adam Street, London, W.C.2 | LONDON: FRIDAY, JULY 7, 1961 | Registered as a Newspaper. Single copies 1s. By post 1s1. Ann. Subn.: 56s. (Abroad 60s.)

Improve Coal sizing, Output and Productivity

WITH THE



A.B. SIXTEEN

PRE-CUTTING

ANDERTON SHEARER-LOADER

Hydraulic Haulage with Auto Control. 100 or 125 h.p. continuously rated water-cooled motor.

Illustration shows version with HAULAGE END COMBINED OVERCUT AND UNDERCUT

Other arrangements available:

Undercut.
Fixed Height Overcut.
Ranging Overcut.

PIONEERS IN POWER-LOADING

ANDERSON, BOYES & CO. LTD

HEAD OFFICE: FLEMINGTON ELECTRICAL WORKS, MOTHERWELL

London Office: 25 Victoria Street, S.W.1

Branches at Gateshead, Rotherham, Cardiff and Glenrothes (Fife).
Represented throughout the coalfields of the world.

OXYGEN STEELMAKING PLANT

British Design and Manufacture

Davy-United's steel processes division is today handling contracts from individual basic oxygen converter furnaces to overall engineering layout for complete steel melting shops. Plant and equipment is fabricated and machined in the workshops of Ashmore, Benson, Pease & Company Limited, Davy-United's associate company at Stockton, where workpieces in excess of 100 tons are regularly manufactured and assembled.

Heavy machine bay in the Stockton workshops. Total floor area of the machine and fitting areas is over 160,000 sq. ft.

Steel processes division

DAVY-UNITED | DAVY-ASHMORE GROUP

DAVY AND UNITED ENGINEERING COMPANY LIMITED . SHEFFIELD . ENGLAND

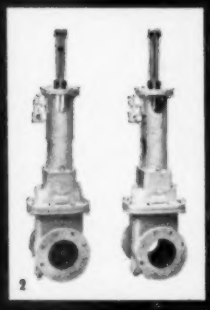
LONDON . STOCKTON . GLASGOW . MIDDLESBROUGH . HULL . PARIS . MONTREAL . MELBOURNE . SYDNEY . JOHANNESBURG . SALISBURY . CALCUTTA . BOMBAY

505

POWER OPERATED HOLMES-WESTERN '55' GAS VALVES

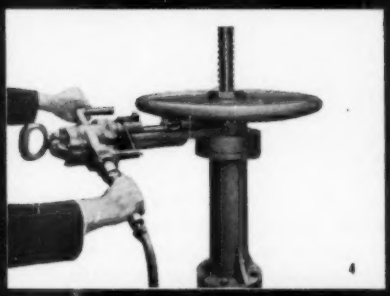
Holmes-Western Valves can be arranged for semi or fully automatic operation, and can, where required, be remote controlled. All electrically operated valves are available in flame-proof, weather-proof and dust-proof designs.

1



2

3



4

1 Electric Motor Operated
A group of valves fitted with Rotork Actuators. Valves of this type have provision for manual operation in the event of a power failure.

2 Hydraulic Cylinder Operated
Two valves fitted with hydraulic cylinders. Pneumatic cylinder operation is also available.

3 Electrical Solenoid Operated
A valve fitted with a dust-proof pull-type solenoid. This valve is designed to close automatically in the event of a power failure.

4 Air Drill Operated
A valve arranged for air drill operation. This semi-automatic method of operation is particularly suitable where full mechanisation is not justified.

CONVERT YOUR EXISTING VALVES TO POWER OPERATION

For full details ask for a copy of Publication No. 76/67.

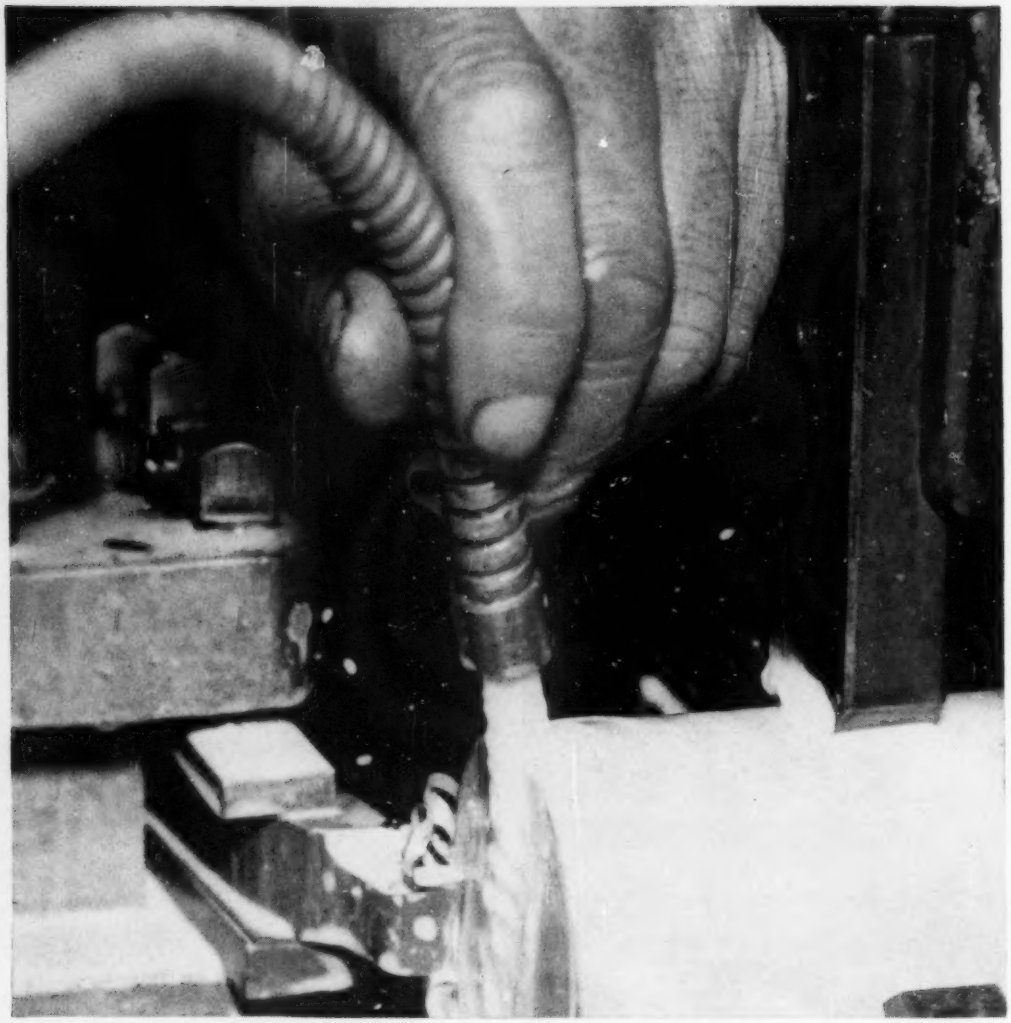
W. C. HOLMES & CO. LTD.

A Member of the B.H.D. Engineers Limited Group of Companies.

Chemical Engineering Division
Turnbridge, Huddersfield
Tel: Huddersfield 5280 London: Victoria 9971 Birmingham: Midland 6830

8889

Shell achievement

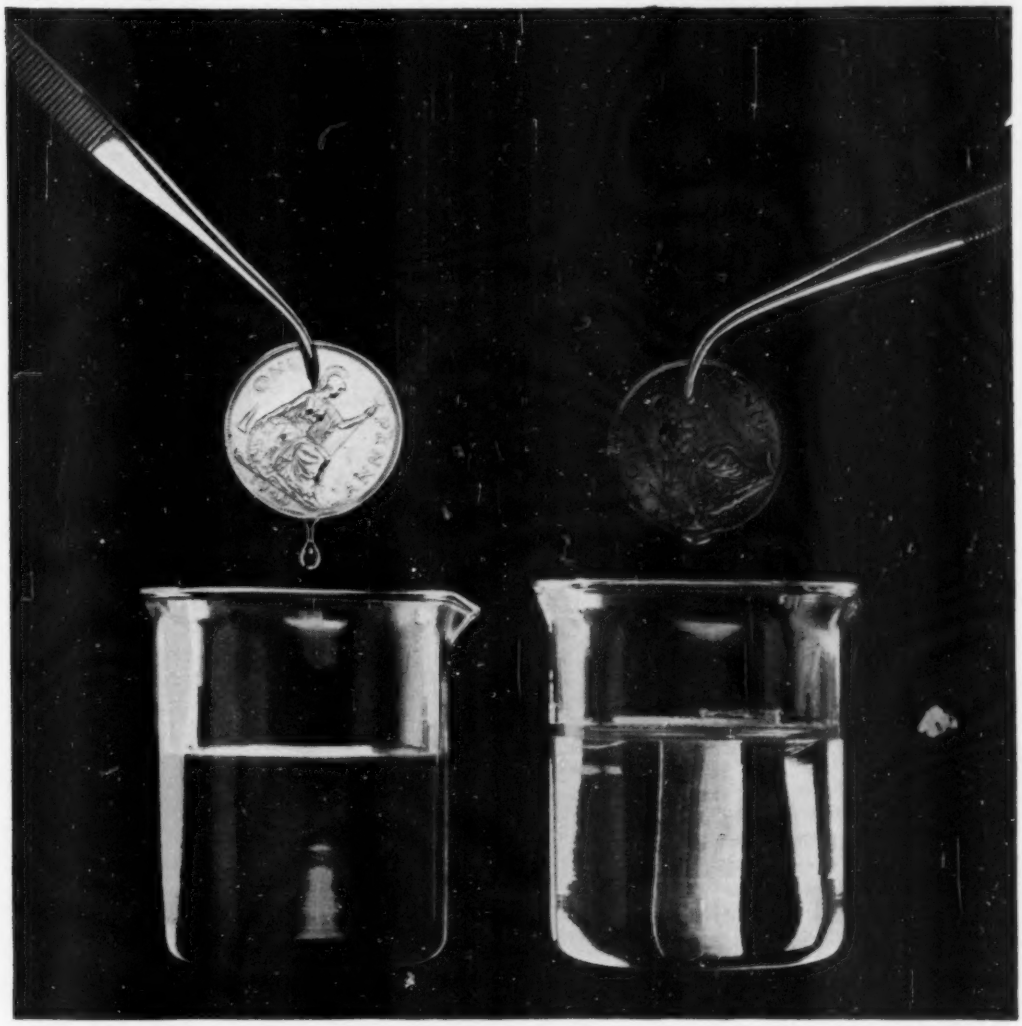


One of Shell's recent achievements in Industrial Lubrication has been to reduce the risk of skin trouble for machine operators. Until the new Shell Dromus range, most modern soluble cutting oils contained phenolic compounds, which can cause skin irritation. They were used as coupling agents between the actual oil and the emulsifier. On high-speed machines, especially, the water evaporates and the emulsion concentrates. And that's when the trouble can start. Shell scientists found a better coupling agent, and made it work. And now, at no extra cost, management can reduce working risks for their staff. *Write for the book, 'Selecting Your Cutting Oils', to Shell-Mex House, London.*

SHELL

SHELL INDUSTRIAL OILS

Shell demonstration



Two clean, bright pennies are placed in beakers of oil, of equal performance level, one Shell Garia Oil 21, the other a conventional cutting oil containing sulphurised additives. After three hours at room temperature one penny is still bright and stain-free, the other heavily stained with black copper sulphide. The bright penny is from the beaker containing Shell Garia Oil 21, the blackened one from that containing the conventional oil. While these were just pennies they could have been bronze bushes in your machine tools—stained in less than half a shift. Sulphur is essential in heavy-duty cutting oils. Special additives in Shell Cutting Oils protect your machine tools and yet allow the sulphur to do its job.

Write for the book "Selecting Your Cutting Oils" to Lubricants Department, Shell-Mex House, London, W.C.2.

DROMUS . . . PELLA . . . MACRON . . . GARIA

SHELL

SHELL CUTTING OILS

Better lamps—better lamprooms

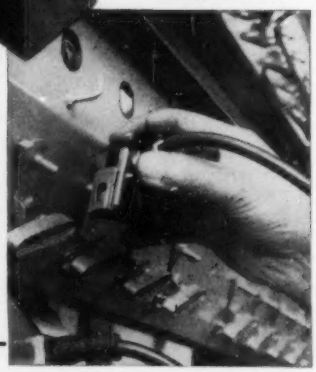
WITH THE NEW

PATTERSON CAP LAMPS

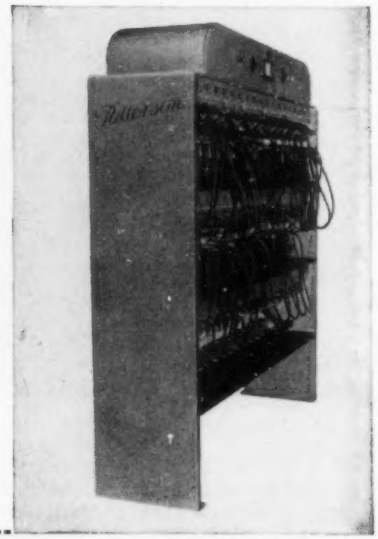
AND CHARGING RACK

Improved light output and long trouble-free life are features of the new Patterson cap lamps. Fitted with high grade reflectors, silver tipped contacts, and Exide lead-acid batteries, they work brilliantly without a flicker.

They are automatically kept at the peak of efficiency by the attractive new Patterson charging rack. This is based on the headpiece key-type charging system and is designed to increase lamproom efficiency and reduce lamproom labour.



The type SS 3 self-servicing cap lamp and headpiece. It fits any standard headpiece key-type charging equipment or can be used with the new Patterson charging rack.



To: PATTERSON LAMPS (1953) LIMITED
1 Second Avenue, Team Valley, Gateshead-on-Tyne 11
Please send me further details of your new cap lamp and charging rack.

NAME_____

ADDRESS_____

PATTERSON LAMPS (1953) LIMITED

Makers of Miners' Lamps and Lamproom Equipment for over 70 years

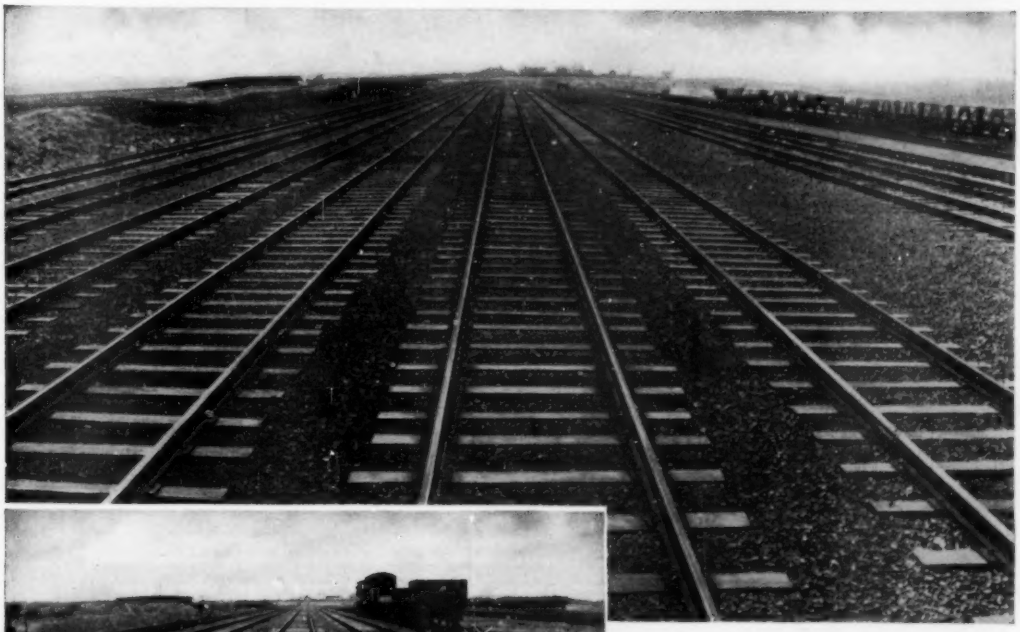
1 SECOND AVENUE, TEAM VALLEY, GATESHEAD-ON-TYNE 11

Telegrams: Lamps, Phone, Gateshead-on-Tyne · Telephone: Low Fell 75481/2

TGA P150A

RAILWAY SIDINGS by WARDS

At the South Durham Steel & Iron Co., Ltd.



Photographs of a recently completed contract at South Durham Steel & Iron Co. Ltd.

With over sixty years' experience, Wards install, maintain and design all types of industrial sidings. Today, their Rail Department's large specialist staff, backed by the resources of the Company, carries out numerous contracts concurrently, irrespective of location or size. Wards, with their specialist staff, can offer their services both as consultants and contractors.

Two free booklets—"Rails and Rail Accessories" and "Railway Sidings by Wards" are available on request.

THOS. W. WARD LTD

ALBION WORKS · SHEFFIELD

Phone: 26311 (22 lines) Grams: "Forward, Sheffield"

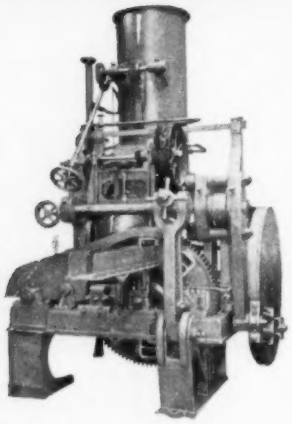
LONDON OFFICE: BRETTENHAM HOUSE, LANCASTER PLACE, STRAND, W.C.2. Telephone: Temple Bar 1515

SC 66

HEAP'S Finest Quality
SCREWING DIES
TANGENTIAL OR RADIAL
IMMEDIATE DELIVERY OF DIES TO BRITISH STANDARD SPECIFICATION
SPECIALS AT SHORT NOTICE
RE-CUTTING SERVICE
Radial type dies re-cut equal to new within a few days
JOSHUA HEAP & CO. LTD.
ASHTON-UNDER-LYNE
PHONE No.: 1868 GRAMS: HEAP, LIMITED, ASHTON-UNDER-LYNE

YEADON SON & Co. Ltd.
4 ALBION PLACE.
LEEDS 1.
TEL. 32409

BRIQUETTE MACHINERY



PITCH CRACKERS.

MIXERS AND MEASURERS.

DISINTEGRATORS.

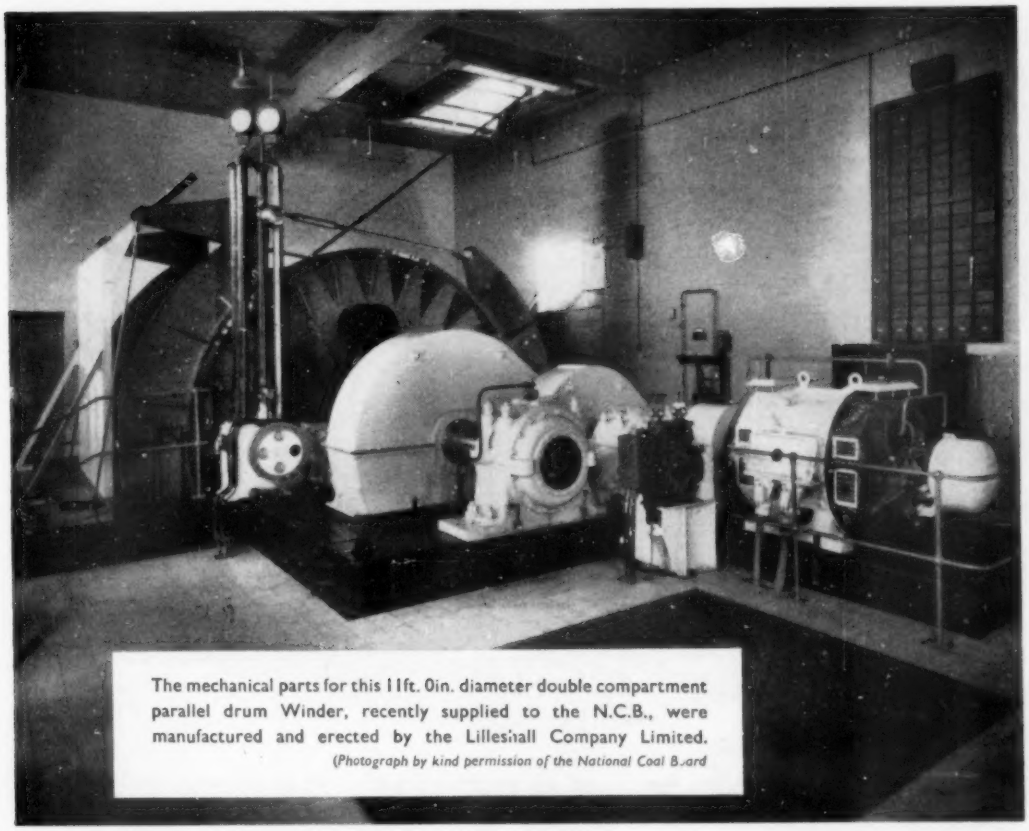
OVOID ROLLS.

OVOID BRIQUETTE MACHINES.

RECTANGULAR BRIQUETTE MACHINES.

COMPLETE PLANTS FOR BRIQUETTING SMALL COAL, COKE, IRON, COPPER AND OTHER ORES.

YOUR OWN MATERIALS TESTED FOR SUITABILITY FOR BRIQUETTING AT OUR OWN BRIQUETTE WORKS IN LEEDS.

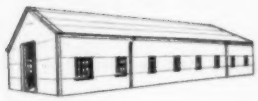


The mechanical parts for this 11ft. 0in. diameter double compartment parallel drum Winder, recently supplied to the N.C.B., were manufactured and erected by the Lilleshall Company Limited.
(Photograph by kind permission of the National Coal Board

Colliery equipment by

Designers *and users* of Colliery equipment since the reign of George III, the Lilleshall Company have been privileged to supply Headgears, Winders, Surface Buildings, Steelwork and other equipment to some of the most modern Collieries in the country. Other Lilleshall products include all types of structural steelwork, prefabricated buildings, refractory and common bricks, precast concrete products, timber products, glazed sanitary ware, and mechanical engineering.

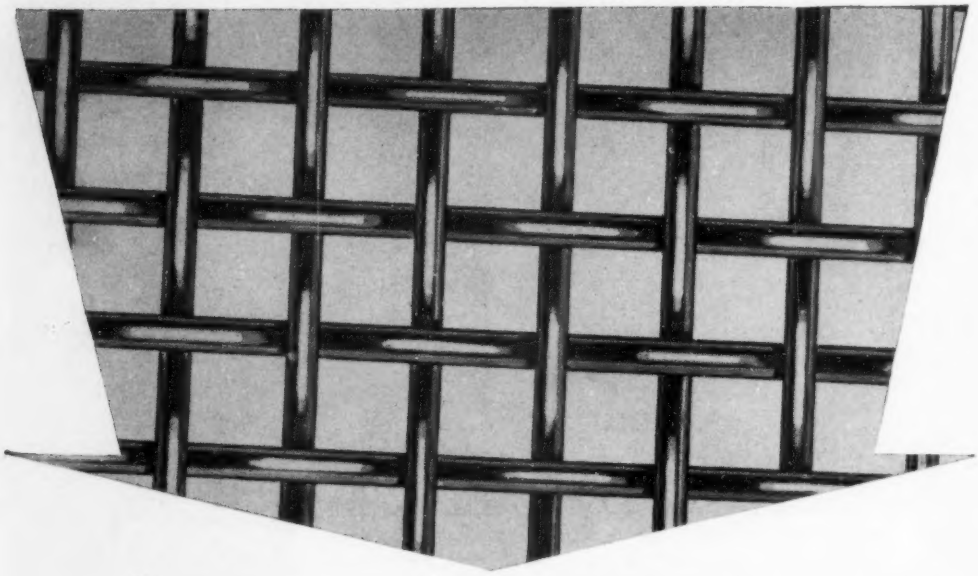
LILLESHALL



KARISCOL
The Lilleshall "Kariscol" prefabricated building system eliminates on-site welding, minimum site bolting permitting speedy erection.

THE LILLESHALL COMPANY LIMITED
ST. GEORGES · OAKENGATES
SHROPSHIRE
TELEPHONE: OAKENGATES 120
L.G.B.

Immensely strong
Resistant to abrasion



VIBRATORY SCREEN MESHES
including special
"AGATE" and "AGATEX"

These are suitable for all particle sizes.

In the field of industrial screening, Greenings have an unrivalled reputation for efficiency and reliability. Woven wire is precision-made in all commercial metals for all industrial uses.

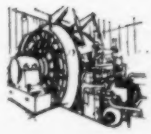
Greenings
N. GREENING AND SONS LTD.
BRITANNIA WORKS
WARRINGTON · ENGLAND
P.O. BOX 22

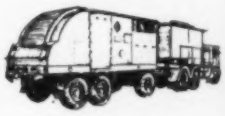
ESTABLISHED
1799
Telephone
WARRINGTON 32401
Telegrams
GREENINGS, WARRINGTON
Telex No. 62195

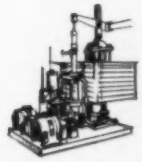
NG 94

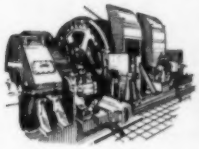
ROBEY
OF LINCOLN

Many thousand tons of coal and many thousand men are moved daily in safety by Robey winders.
Drum, Friction, Mobile Winders · Robey-Crompton Patent Positive Power and High Pressure Brakes.
Welded all-steel Headgear Pulleys

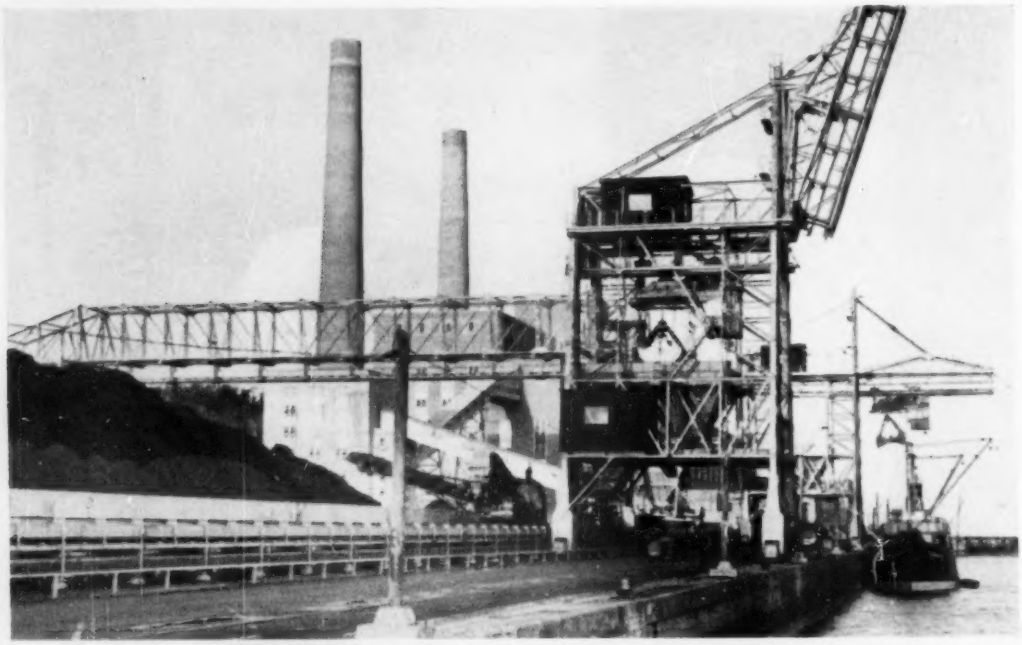






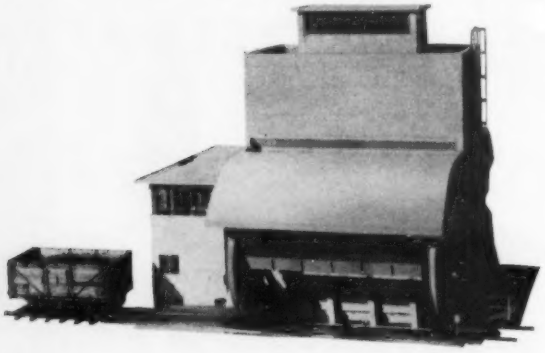


ROBEY & CO. LTD
MINING DEPARTMENT · PO BOX 23 · LINCOLN 21381
LONDON OFFICE · 11 PRINCES STREET · HANOVER SQUARE W1
HYDE PARK 4971



BULK HANDLING PLANT by STRACHAN & HENSHAW

The coal handling plant at the Portishead power station of the Central Electricity Generating Board incorporates: two Ship Unloaders of 150 t.p.h. each: one Storage and Reclaiming Transporter (260 t.p.h.) two Rotaside Wagon Tipplers (with S & H patented Dust Trapping System). Wagon marshalling plant etc. One of the dust trapping Wagon Tipplers is shown below.



SHIP UNLOADING • STORAGE & RECLAIMING • WAGON TIPPLING • WAGON MARSHALLING

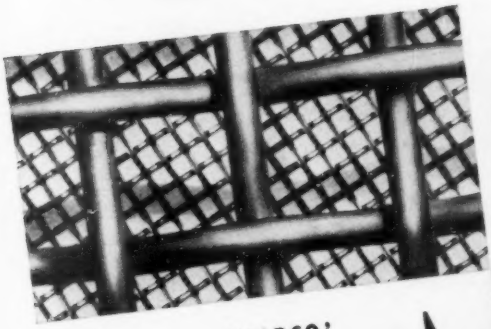
STRACHAN & HENSHAW LTD

STEELHOIST WORKS · BRISTOL 2 · ENGLAND

LONDON · GLASGOW · JOHANNESBURG · MELBOURNE · CALCUTTA · CHRISTCHURCH (N.Z.)

3 THINGS TO REMEMBER

WHEN ORDERING SCREENS AND FILTERS

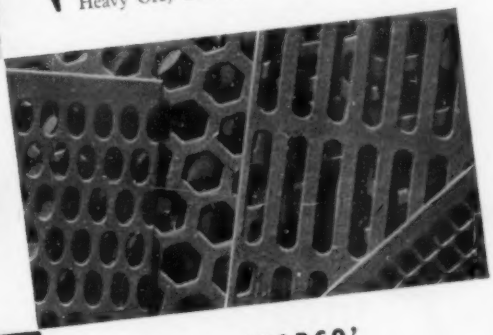


HARVEY HIGH CARBON STEEL WIRE SCREENS

Woven from steel made to Harvey's own analysis, these screens offer the maximum resistance to abrasion and fracture from fatigue. Highly recommended for use with all grades of Coal, Stone, Heavy Ore, Granite, Sand and Gravel.

2 'HARCO' PERFORATED METALS

Highest quality metals with clean and accurate perforations ensure long life and trouble-free service. A wide range of sizes and patterns is available, including many for specialised purposes. Ornamental and embossed patterns also supplied.



3 'HARCO' WOVEN WIRE

Uniform and dependable sizing makes this the ideal cloth for powders and liquids. Any gauge and any mesh can be supplied in a wide range of metals covering all industrial uses. Complete Filters and Strainers of various types also supplied.

Illustrations and details are in our Catalogues Nos. 926 and 1042. Please send for copies.

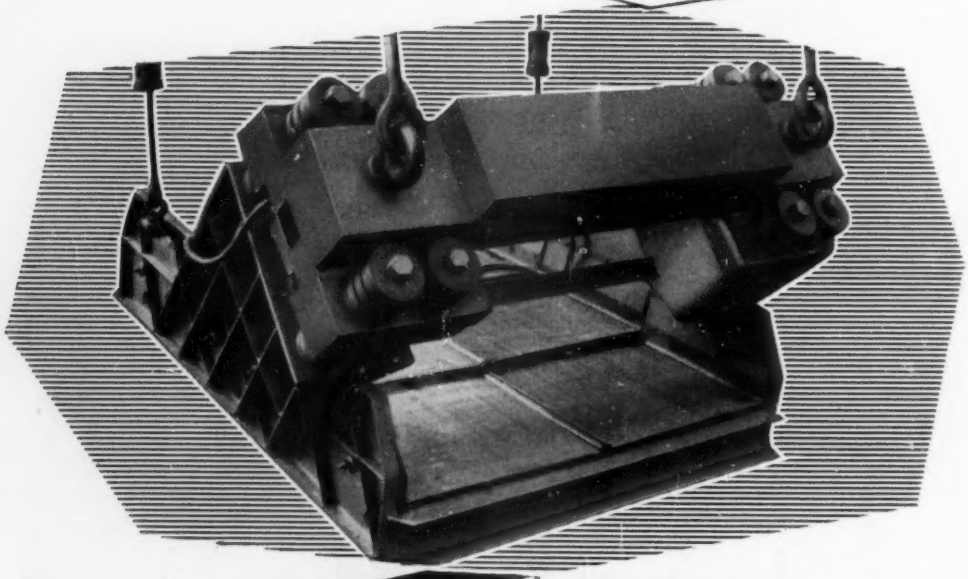
HARVEY

G. A. HARVEY & CO. (LONDON) LTD.
WOOLWICH ROAD · LONDON · S.E.7
Telephone: GREenwich 3232 (22 lines)

Other HARVEY Facilities and Products: CLASS 1 WELDED PRESSURE VESSELS TO LLOYD'S AND A.S.M.E. CODES · DIE-PRESSED AND 'ROTARPREST' HEADS UP TO 15 ft. DIA.—*Larger sizes to specification* · SHEET METALWORK OF EVERY DESCRIPTION · HEAVY MACHINING & FITTING · STEEL SHELVING & STORAGE EQUIPMENT · GALVANIZING · TANKS, CISTERNS & CYLINDERS

W/W.P/2

SPOTLIGHT ON BULK HANDLING EQUIPMENT **SCREENS**



HIGH-SPEED EFFICIENCY WITH VIBRATING SCREENS

For screening intermediates and fines down to approximately 60 mesh, G.E.C. Sherwen electro-magnetic Vibrating Screens achieve great efficiency owing to the rapidity, small amplitude and direction of the vibrations. There is a range of sizes available, with single or double decks. The totally-enclosed vibrating mechanism is dust-proof, and all operating adjustments can be made while the machine is working. The suspended screen design reduces installation costs to a minimum, while the absence of rotating parts means easy maintenance.

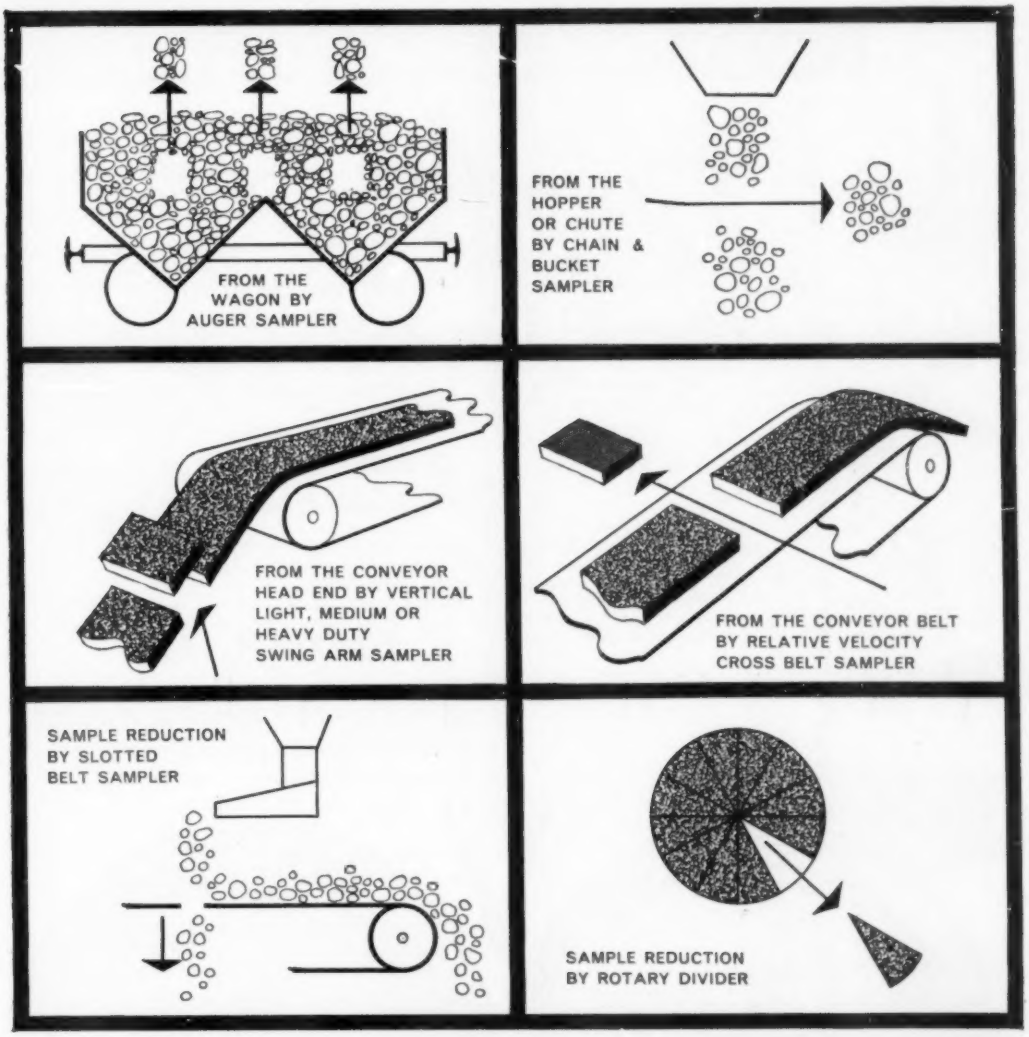
Efficient blenders, expertly-designed crushers, the world's largest range of screens and feeders —all are products of the skill, craftsmanship and experience of one of the world's largest engineering organisations.

rely on the experience of

G.E.C.

488

THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND · GENERAL ENGINEERING GROUP · ERITH · KENT


FROM THE WAGON BY AUGER SAMPLER
FROM THE HOPPER OR CHUTE BY CHAIN & BUCKET SAMPLER
FROM THE CONVEYOR HEAD END BY VERTICAL LIGHT, MEDIUM OR HEAVY DUTY SWING ARM SAMPLER
FROM THE CONVEYOR BELT BY RELATIVE VELOCITY CROSS BELT SAMPLER
SAMPLE REDUCTION BY SLOTTED BELT SAMPLER
SAMPLE REDUCTION BY ROTARY DIVIDER

a complete range of sampling equipment

Registered Office and Materials Handling Dept.
BIRTLEY · CO. DURHAM
PHONE BIRTLEY 248/9 · CABLES: BIRTLEY · NEWCASTLE UPON TYNE

Coal Preparation Dept.
MARKET PLACE CHAMBERS · WEST BARS · CHESTERFIELD · ENGLAND
TEL: CHESTERFIELD 4116 (2 lines) CABLES: BIRTLEY, CHESTERFIELD

London Office
B·S·A HOUSE · 54 ST. JAMES STREET · LONDON S·W·1
PHONE HYDE PARK 8551

BIRTLEY ENGINEERING LTD

Lubrication Plus Protection

Mobilux Grease is a lithium-base lubricant of excellent structural stability and purity. It is a new, general-purpose grease superseding conventional greases. It provides effective lubrication for the majority of grease applications over a temperature range from minus 20°F to 250°F. It is exceptionally resistant to water washing and contains special additives to prevent rust formation. Both in the laboratory and in the field Mobilux Grease has proved its outstanding efficiency as a lubricant and protector.

MOBILUX GREASE

Mobil

MOBIL INDUSTRIAL LUBRICANTS

when you call in Boyles Bros. ...

3 factors will decide the final outcome

Equipment

We make it! We manufacture a complete line of modern diamond drills—underground and surface models, compressed air, gasoline or diesel power. Capacities range from 200 to 5000 feet. We also manufacture hundreds of auxiliary items—everything from core splitters to 60-foot derricks. We are exclusive manufacturers of PERMASET diamond bits and reaming shells—available in all standard sizes and in a multitude of patterns developed to penetrate every known formation with speed, economy and maximum core recovery.

Experience

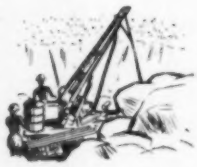
We have it! During the last 30 years, Boyles Bros.' crews have successfully completed more than 3000 contracts in mining areas throughout the world. As a result of this wide experience we have developed equipment, techniques and procedures to cope with every formation, every transportation and climatic problem likely to be encountered on drilling operations anywhere.

Efficiency

We maintain it! Once begun, no Boyles Bros. drilling program is ever halted for want of men, equipment, bits or parts. Crews are handpicked for experience, dependability and local knowledge; they operate under expert supervision at all times. With strategically located branches and subsidiary companies, we are equipped to render real service in core or blasthole drilling, foundation tests, soil sampling, horizontal drainage drilling and other related problems.

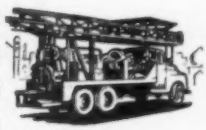
For information and quotations, submit your requirements to Newcastle upon Tyne, 3.

UNITED KINGDOM



AFRICA

FRENCH MOROCCO



PAKISTAN

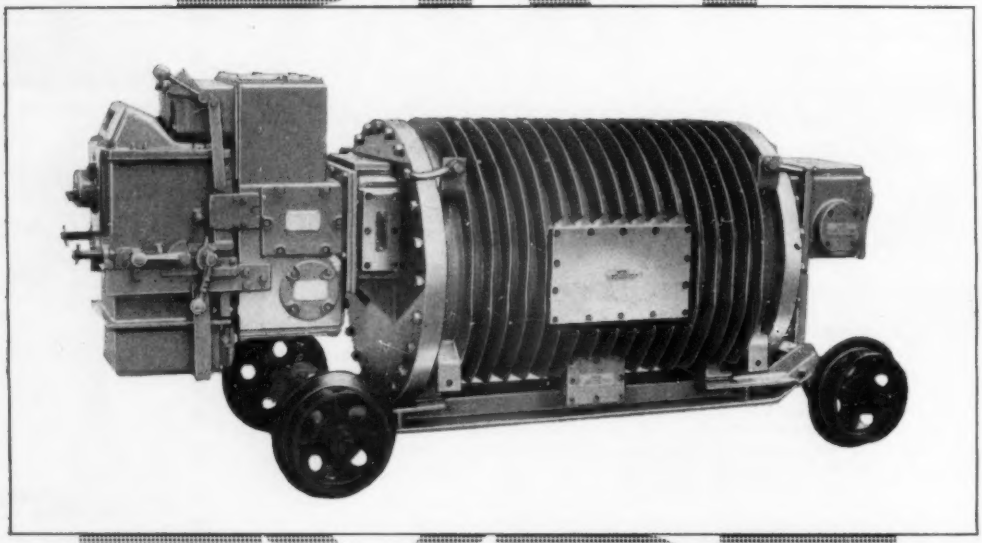
RUSSIA

...all three work constantly for you on every job we do.

WE LOOK INTO THE EARTH

BOYLES BROS
DRILLING COMPANY LTD.
NEWCASTLE - UPON - TYNE 3
ENGLAND

FLAME PROOF DRY TYPE MINING TRANSFORMERS



1 *The most widely used and first wholly British Dry-Type Transformer of its kind. Unlike the more conventional units it can be taken right up to the coal face. Location close to load centre reduces voltage drop through connecting cables and ensures better starting and operation of coal cutting motors.*

2 *Strong tank, free from projections likely to collect dust, can withstand normal falls of rock commonly experienced near coal face.*

3 *High temperature dry type windings eliminate cooling fluids and possible hazards caused by fire or toxic gases. Maximum case temperature below that of conventional oil filled transformer. Further drop in temperature across cooling fins acts as safeguard against burn discomfort through accidental contact.*

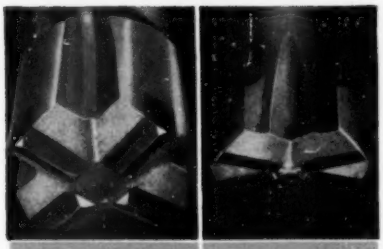
BRUSH

BRUSH ELECTRICAL ENGINEERING CO · LTD LOUGHBOROUGH · ENGLAND

A Member of the Hawker Siddeley Group

FLP 4196 GROUP I

Z.4



WANT TO DRILL HOLES?
REALLY FAST??
REALLY CHEAPLY???

Look at these performances achieved with the Gardner-Denver Air Trac using the revolutionary PR123J Deep Hole Drill featuring independent rotation. In conjunction with

WICKMAN

Tungsten Carbide Bits
—this is the fastest drilling combination in the field.

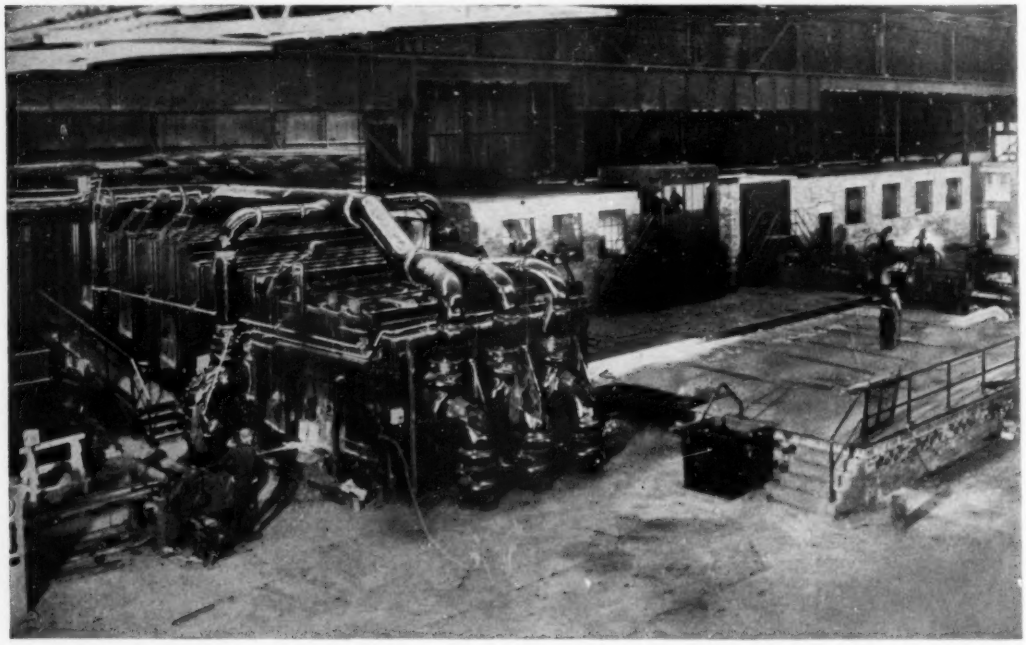
Let the Mining Engineers of Wickman Limited, sole agents for Gardner-Denver Mining and Construction Equipment, assist you with your drilling problems.

For further particulars contact:

WICKMAN LIMITED
MINING DIVISION, BOTTRILL STREET, NUNEATON

The performances quoted below are overall drilling speeds and include setting up, drilling, adding and withdrawing rods.

Location	Type of Ground	Depth	Dia.	Overall Drilling Speeds
South Wales	Medium granite	100 ft.	4"	40 ft. per hour
North Wales	Hard, tough, granite	90 ft.	4"	20 ft. per hour
Derbyshire	Medium limestone	90 ft.	3"	80 ft. per hour
Leicestershire	Hard granite	50 ft.	4"	30 ft. per hour



Typhoon

ROTARY FLAME

GAS BURNERS

Typhoon Gas Burners ensure intimate mixture of Gas and Air.

The absolute minimum of space.

Highest possible Flame Temperature.

Accurate regulation and absolute control of Furnace Atmosphere.

Increased Output with Less Fuel.

Equally suitable for crude producer gas, blast furnace, coke oven mixed or town gas.

Other Specialities

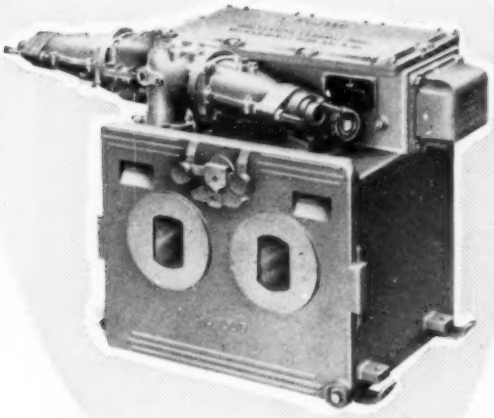
Morgan Gas Machines. Soaking Pits (Isley Controlled). Mill Furnaces. Hot Metal Mixer Cars. Nassheuer Continuous Bright Annealing Furnaces (Sole Licensees).

THE INTERNATIONAL CONSTRUCTION CO. LTD.

(Successors to Julian Kennedy—Sahlin & Co. Ltd.)

56 KINGSWAY LONDON W.C.2

Phone: HOLBORN 1871-2 Grams: SAHLIN, WESTCENT, LONDON 2



General view of Huwood Recording panel with B.I.C.C. flit plugs.

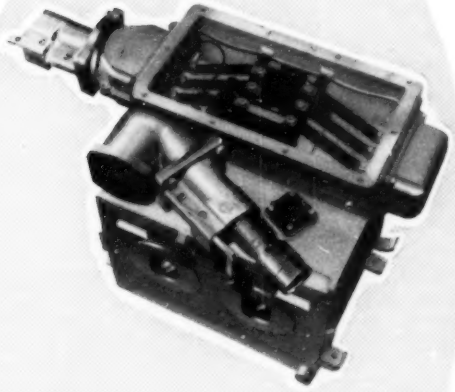
The HUWOOD FLAMEPROOF RECORDING PANEL Type HM12

The instruments most frequently supplied with the panel are a combination of ammeter, voltmeter and kilowatt meter controlled by a common drive and recording on separate charts, but the panel is suitable for power factor meter, frequency meter or integrating kilowatt hour meter.

FLP

A VERSATILE RECORDER

View of panel from above. Fitted with incoming and outgoing Huwood 100 plugs and sockets. Provision for direct reading voltmeter (or ammeter).



Can be used with pliable armoured cable fittings such as the Huwood 100 & 30 amp. plugs—Groups I & II.
. . . with B.I.C.C. flit plugs—Group I, or with Huwood cable box—Groups I & II.

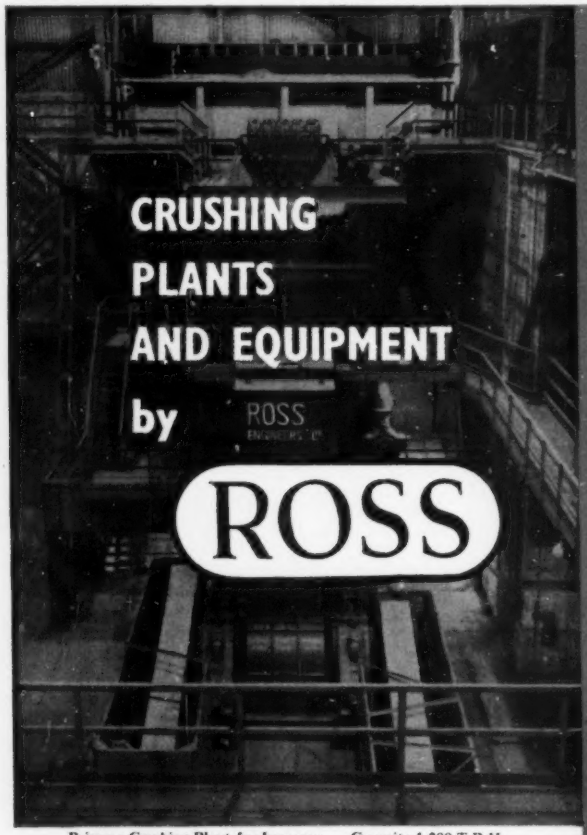
This flameproof recorder is available for many different recording instrument arrangements, is rated for up to 200 amps. 650 volts, and can be banked both with any gate-end box to N.C.B. specification and with most switchgear prior to this specification.

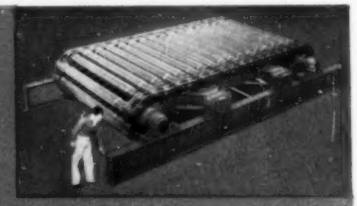
HUGH WOOD & CO. LTD.

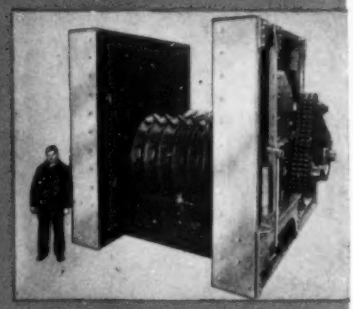
Head Office and Factories:
GATESHEAD - ON - TYNE, 11.
Telegrams: Huwood, Gateshead. Telephone: Low Fell 76083 (5 lines).

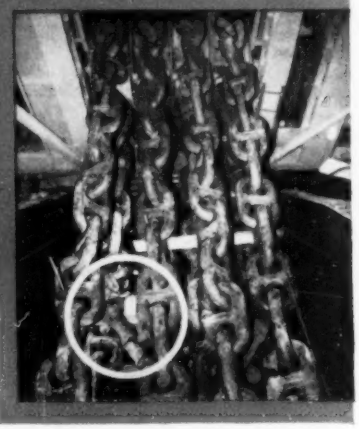
Industrial and Export Office:
ROYAL LONDON HOUSE, FINSBURY SQUARE, LONDON, E.C.2.
Telegrams: Huwood Stock, London. Telephone: Monarch 3273 (4 lines).

EE/FA/203









Primary Crushing Plant for Iron ore: Capacity 1,200 T.P.H.

Over 35 years' experience and know-how in the design, construction and erection of complete CRUSHING AND SCREENING PLANTS, MATERIAL HANDLING EQUIPMENT AND WAGON HANDLING PLANTS for ore, stone, coal, slag, etc. for the Iron and Steel, Cement, Quarrying and Mining Industries.

If your material is dirty or sticky we have an unrivalled experience of the problem and a record of success.

Top—Ross Patent Drop-Bar Feeder
Centre—Ross Patent Two-Roll Grizzly
Bottom—Ross Patent Chain Feeder

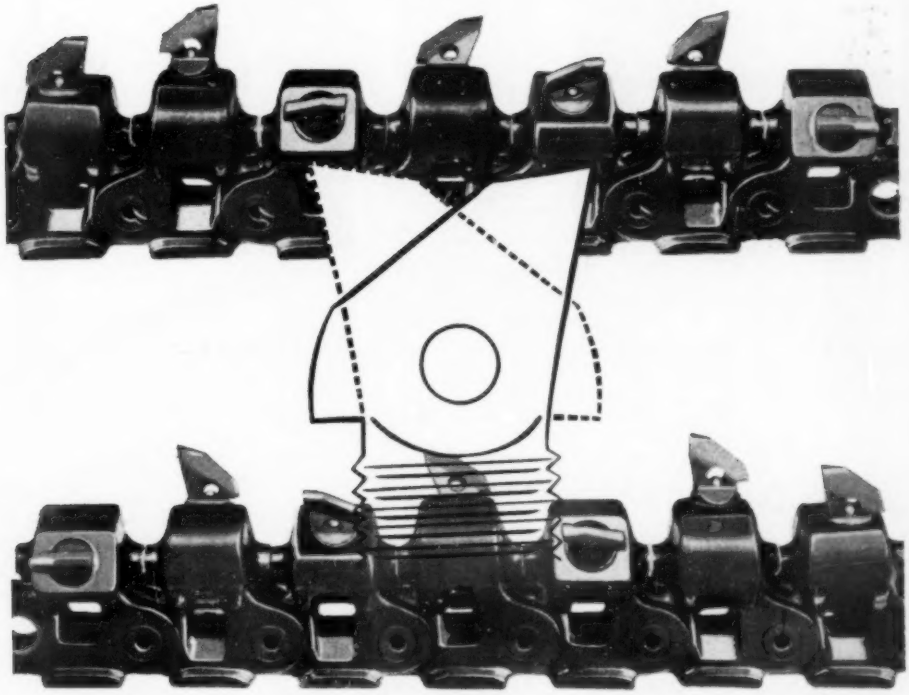
ROSS ENGINEERS LTD.,
11 WALPOLE ROAD, SURBITON, SURREY
Telephone: Elmbridge 2345 and 2903
ROSS SCREEN & FEEDER CO., WESTFIELD, NEW JERSEY, U.S.A.
CANADIAN LICENCEES: DORR-OLIVER-LONG LTD., ORILLIA.

PMT1

ROSS

TURNING POINT

"a point . . . at which decisive change occurs" *(Dictionary definition)*



This is a remarkably apt description of the Hoy Reversible Pick

Wherever two-way cutting is in operation, the Hoy Reversible Pick in the new R. P. cutter chain can be turned and decisively locked in the new cutting position in a matter of seconds. No setscrew—no wrench—nothing but a tommy-bar is needed. The substantial saving in lost time compared with conventional pick turning can mean a turning point in production costs.

Hoy R.P. chains are fully described in a broadsheet of which copies are available on request.

hoy

REVERSIBLE PICK

COAL CUTTER CHAINS

Patent No. 806,174

AUSTIN HOY AND COMPANY LIMITED

STATION WORKS · SAUNDERTON · HIGH WYCOMBE

Telephone: NAPHILL 2353 Grams: MULTIHOY HIGH WYCOMBE

RP3

'FULBOR' VALVE

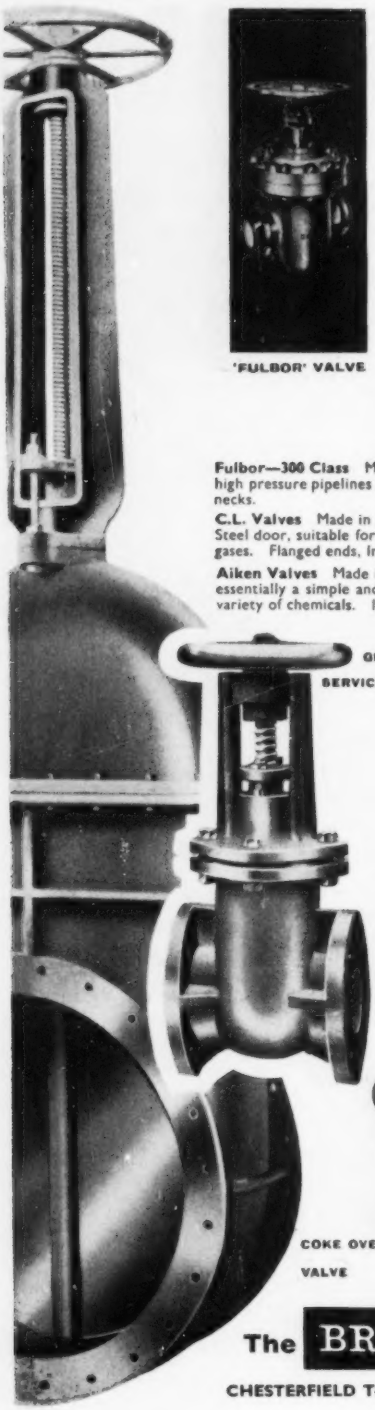
'C.L.' VALVE

'AIKEN' VALVE

Fulbor—300 Class Made in sizes from 3" to 24" Bore, particularly suited for high pressure pipelines up to 750 p.s.i.g. made with either flanged ends or welding necks.

C.L. Valves Made in sizes from 2" to 24" Bore, Cast Iron construction. Stainless Steel door, suitable for working pressures up to 100 p.s.i.g. on various types of gases. Flanged ends, Internal Screw operated.

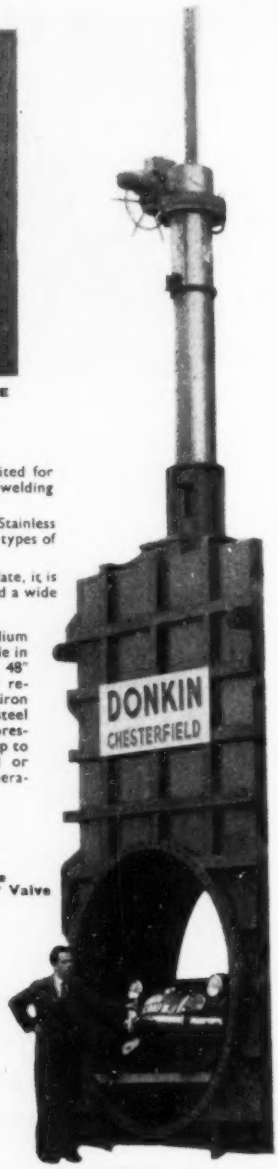
Aiken Valves Made in sizes from 3" to 15" Bore, Cast Iron spectacle plate, it is essentially a simple and economical low pressure valve, ideal for gas and a wide variety of chemicals. Internal Screw operated.



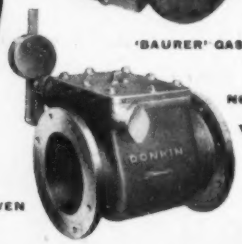
GENERAL SERVICE VALVE

Baurer Valves Medium pressure valve, made in sizes from 4" to 48" Bore, or larger if required, with cast iron or fabricated mild steel bodies. Working pressure on large sizes up to 45 p.s.i.g. Internal or External Screw operation.

'BAURER' GAS VALVE

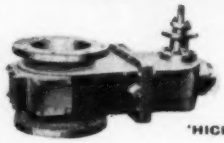


90" Bore "SEALBOR" Valve



NON-RETURN VALVE

COKE OVEN VALVE



'HICKS' VALVE

The **BRYAN DONKIN** Company Limited

CHESTERFIELD Telephone 3153 LONDON Telephone ABBey 1096

The Sutcliffe Stable Hole Conveyor

THE ELECTRIC DRIVE IS SUITABLE FOR STARTING WITH DRILL PANELS TO STANDARD SPECIFICATION No. P.9/1950. HYDRAULIC AND COMPRESSED AIR DRIVES ARE ALSO AVAILABLE.

for confined space conveying

Incorporating a new drive, the Sutcliffe Stable Hole Conveyor is ideally suited for working in confined spaces such as stable holes in advance of the coal face. It is easily transported by sliding on steel skids and has a capacity of 50 tons of coal or stone per hour. The new drive includes a heliocentric gear mounted in a drum shell (made by Sutcliffe) and powered by a flange mounted Brook motor, continuously rated at 1.33 h.p. Normal drum centres are 10 ft., and an 18 ins. wide P.V.C. belt is supplied. Please send for full details and a copy of our latest leaflet, ref: IR/146.

Sutcliffe

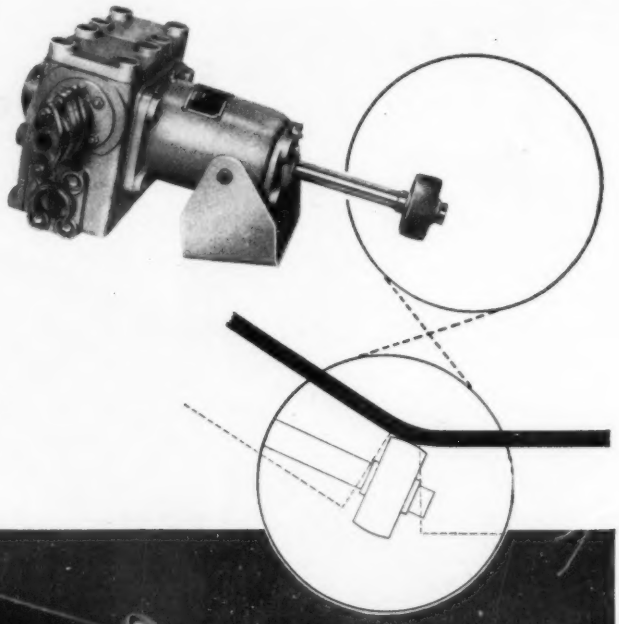
Britain's Best Conveyors

RICHARD SUTCLIFFE LIMITED HORBURY WAKEFIELD

RS.146

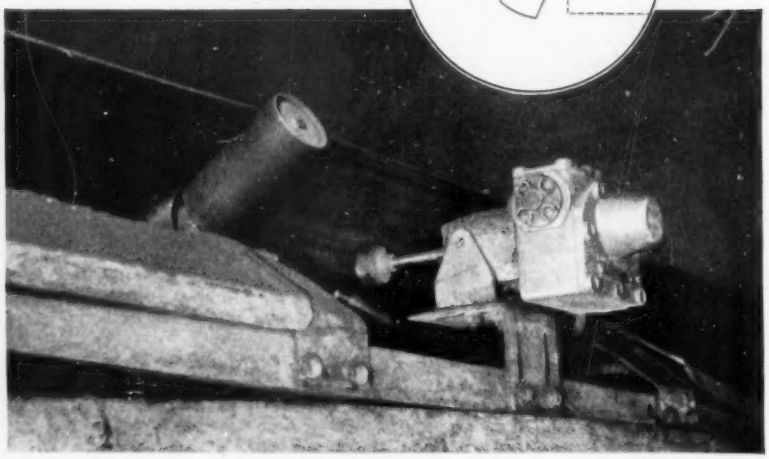
'ACOMB'

Sequence Control and Belt Protection Switches



FLP

There are many more good reasons for fitting "Acomb" switches explained in our technical folder. We shall be pleased to send you a copy.
Non-flameproof switch is also manufactured with cable glands to suit customers' requirements.



- DRIVEN DIRECT FROM THE BELT
- ALWAYS IN CONTACT WITH THE BELT
- NO AUXILIARY DRIVE NECESSARY
- READILY FITTED TO EXISTING CONVEYORS

Mackley

E. N. MACKLEY & COMPANY
(PROPRIETORS: CLARKE, CHAPMAN & CO. LTD.)
HAWKS ROAD · GATESHEAD 8 · CO. DURHAM
Telephone: 72237-8 Telegrams: "Hylift," Gateshead

LONDON OFFICE: Dunster House, Mark Lane, E.C.3. Telephone: MINcing Lane, 8345-6-7 Telegrams: "Cyclops," Easphone, London

M16

MODERN MINE CAR HANDLING

WESTINGHOUSE

Colliery Equipment

is

QUICKER — SAFER — EASIER

WESTINGHOUSE BRAKE AND SIGNAL CO., LTD.
82 York Way, King's Cross, London, N.1 *Tel: TERminus 6432*

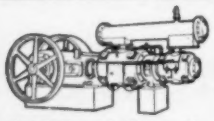
An UNDERGROUND COMPRESSOR

that's COOL as well as COMPACT

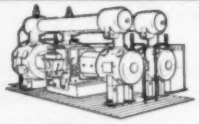
LOW HEIGHT
ROTARY COMPRESSOR
for
UNDERGROUND
MINING

Specially designed as a low-height mine car unit, this Class RE 'Power Vane' Rotary Electric Compressor has the compact appearance typical of this type of machine. Another special feature is cool running—the discharge temperature being some 100°F lower than that of any equivalent reciprocating compressor. Standard models may be air or water-cooled, and flameproof drive and full protection equipment is fitted for safe, underground service As rotary units, there are no pistons, valves or crankshaft to go wrong, and maintenance is simplified. 'Power Vane' Compressors are available for service up to 500 c.f.m. at normal working pressures. *Full technical literature on request.*

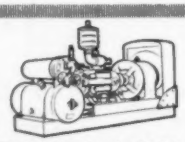
THERE IS A CP COMPRESSOR FOR EVERY TYPE OF DUTY



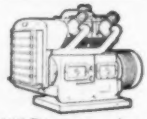
CLASS T straight-line, double-acting, single and multi-stage compressors for outputs up to 745 c.f.m. or pressures up to 2,500 p.s.i.



CLASS FE balanced-opposed multi-cylinder compressors for outputs up to 8,000 c.f.m. or pressures up to 3,000 p.s.i.



CLASS RE electrically driven Rotary Air Compressors for outputs up to 510 c.f.m. at 100 p.s.i.



CLASS P two stage air-cooled compressors for outputs up to 477 c.f.m. at 100 p.s.i.

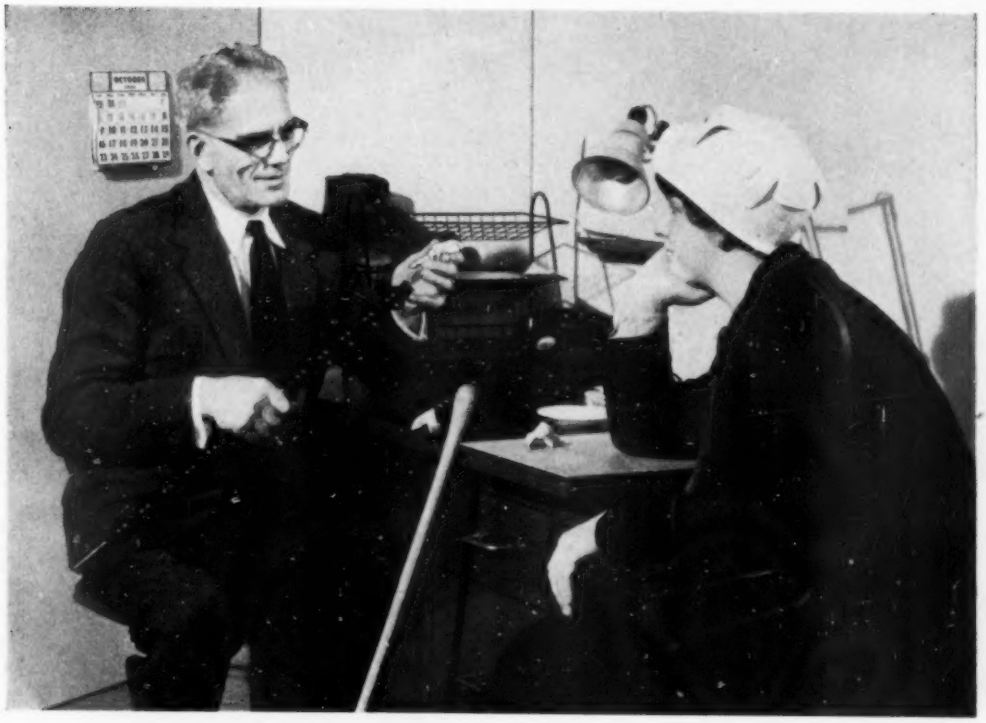
Consolidated Pneumatic

CONSOLIDATED PNEUMATIC TOOL CO. LTD · DAWES ROAD · LONDON · S.W.6.

CP/254

Diamonds...Girl

DIAMONDS . . . GIRL? Yes, " Black Diamonds," the standby of the Country's power supply and our economic wealth. *You sound very positive, Dad?* Yes, but these tools play their part in the use of modern methods of coal getting. Keep costs down too. *They certainly look formidable! what do they do?* The Bit, at the end, drills shot firing holes very quickly, making the minimum of dust, and the screw shaped Rod keeps the hole clear of waste. *What are the different coloured pieces at the end of the Bit?* Ah! That's a P & V speciality — Tungsten Carbide tips; prevent the Bit from wearing out too fast. *What's P & V?* P & V stands for Padley & Venables who make these Bits and Rods. They're experts in the making of Mining and Quarrying tools. You'll find them in every coalfield and in quarries throughout the Country — and the World over. They're your dad's standby in meeting production targets. I wish they were more easy to come by, but their popularity means that demand exceeds supply . . . at the moment. *Little Jewels in their own right, eh, Dad?* Yes . . . but off to your homework now or **you** won't be teacher's " Little Jewel " tomorrow



Padley & Venables Ltd.,

Proprietors of RIP-BITS LTD., Sheffield.

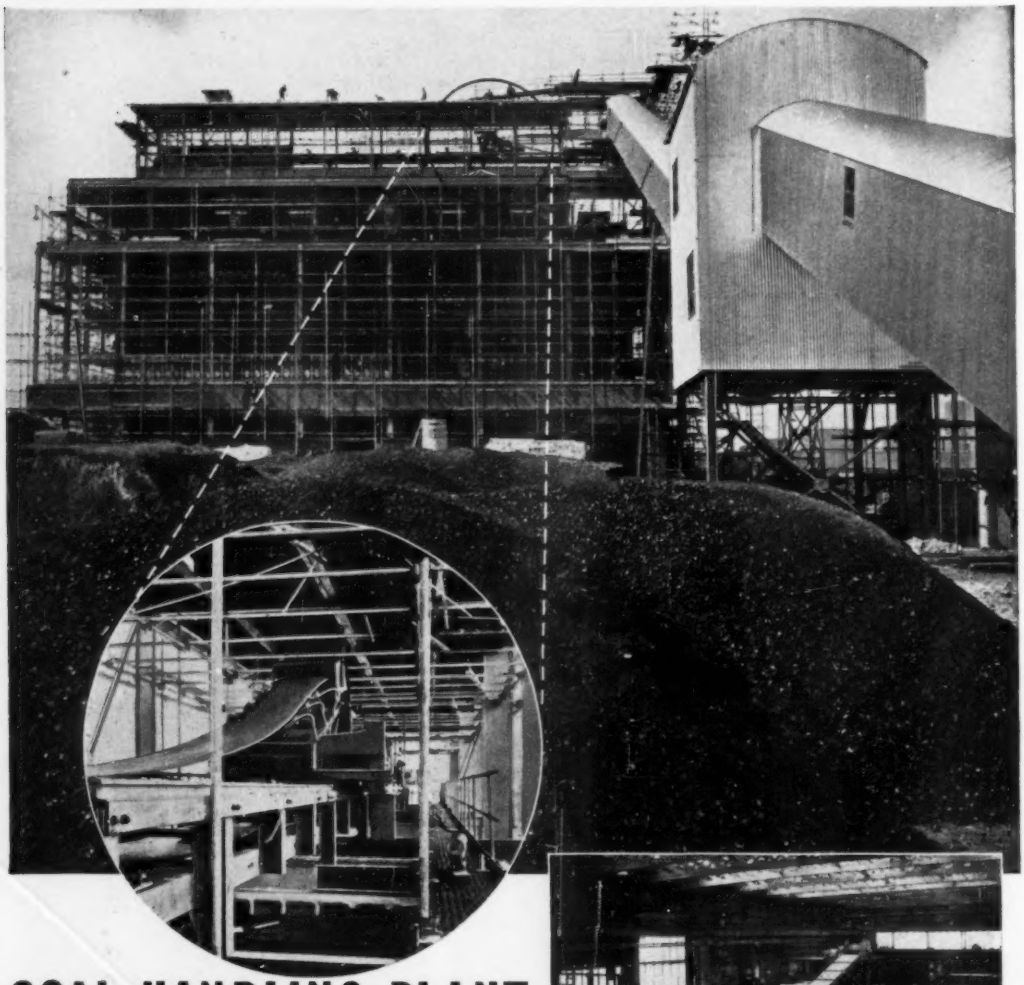
CALLYWHITE LANE, DRONFIELD, SHEFFIELD.

Tel: Dronfield 3301 (6 lines) Grams: "EXCAVATE" Dronfield, Sheffield.

London Office: CLUTHA HOUSE, 10, Storey's Gate, S.W.1. *Tel: Whitehall 0678/9*

Offices at: NEWCASTLE, CARDIFF & STIRLING

Manufacturers of Quality Tools and Accessories to the Compressed Air and Mining Industries for half a century.



COAL HANDLING PLANT

Illustrated above, during construction, is the boiler house at Messrs. Courtaulds Ltd. new Grimsby factory. The coal conveying plant was manufactured by John Thompson Conveyor Co. and handles 100 tons an hour, receiving from both rail and road transport, feeding boiler house bunkers via a distributing conveyor and automatic tripper.

We are able to design and manufacture coal conveying machinery for every purpose carrying the job through from drawing board to site.

John Thompson Conveyor Co. fabricated and manufactured twin apron plate conveyors, each 60 ft. long by 7 ft. wide to the design of Davy & United Ltd., for the Dorman Long rod and merchant mill.

JOHN THOMPSON GROUP

JOHN THOMPSON CONVEYOR COMPANY · WOLVERHAMPTON

A subsidiary of **JOHN THOMPSON INDUSTRIAL CONSTRUCTIONS LTD.**

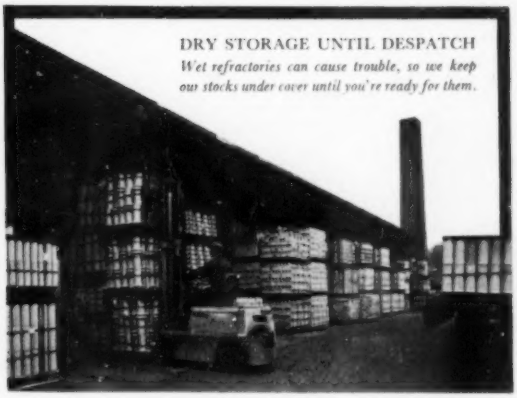
TAVISTOCK HOUSE EAST, WOBURN WALK, TAVISTOCK SQUARE, LONDON, W.C.1

Telephone: **EUSton 9393**

CP14

Tailored for hard wear

Sleeves by Wraggs of Sheffield are made from only the highest quality raw materials to offer maximum resistance to the fiercest ladle conditions.
Just the kind of products you'd expect from a firm which pioneered the manufacture of casting pit refractories, and which still specialises in this field.


DRY STORAGE UNTIL DESPATCH
Wet refractories can cause trouble, so we keep our stocks under cover until you're ready for them.

LADLE LINING BRICKS · NOZZLES · STOPPERS · SLEEVES · TRUMPET GUIDES
TRUMPET BELLS · CENTRE & RUNNER BRICKS · INGOT FEEDER TILES

Wraggs of Sheffield

for reliable casting pit refractories

THOS. WRAGG & SONS (SHEFFIELD) LTD., LOXLEY, NR. SHEFFIELD. TELEPHONE: 343034

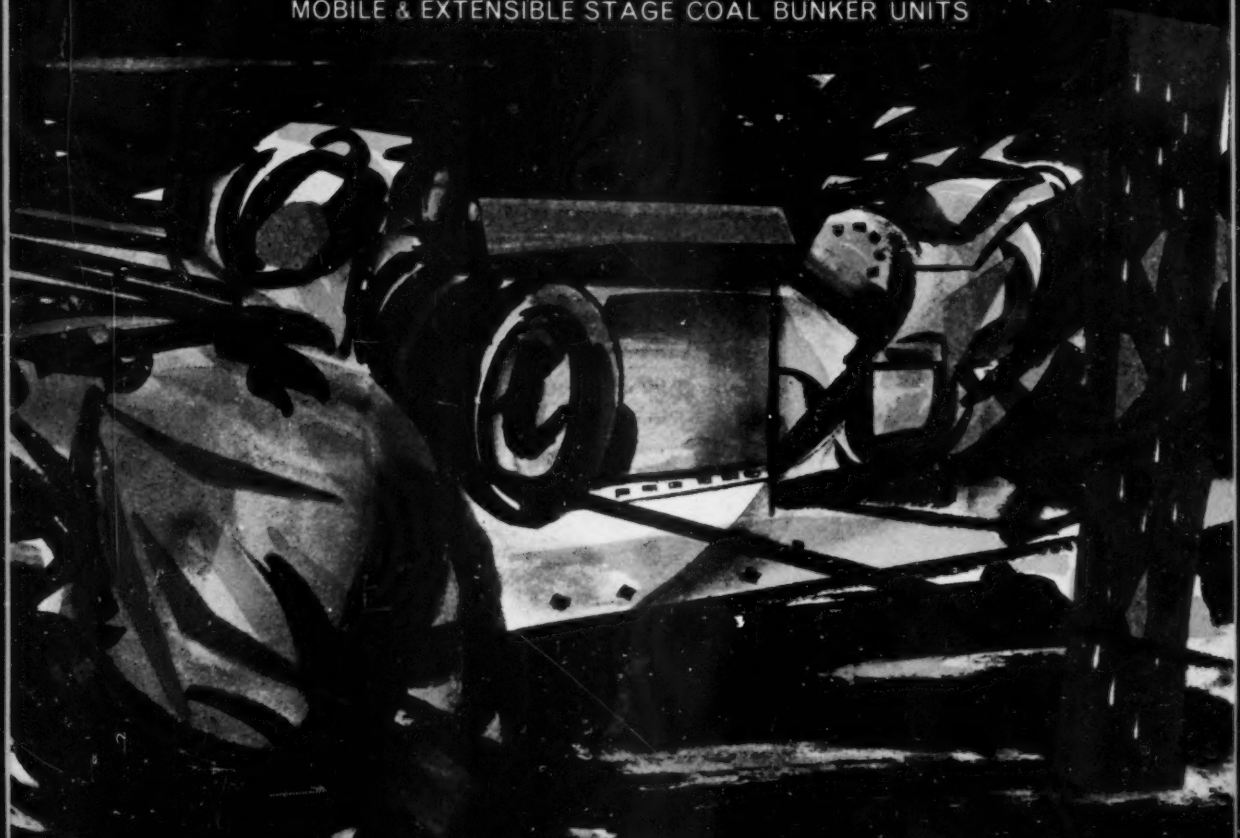
3A

CRAWLEY

MINING EQUIPMENT

Crawley thin seam mining equipment includes:—

CRAWLEY-WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
HEAVY DUTY SNAKING CONVEYORS · EXTENSIBLE STAGE LOADERS
STATIONARY BUNKER CONVEYORS · EXTENSIBLE TUB LOADERS
MOBILE & EXTENSIBLE STAGE COAL BUNKER UNITS



Write for **CRAWLEY** *"Mining Equipment" Catalogue NOW!*

THE CRAWLEY

HEAVY DUTY ARMOURED SNAKING CONVEYOR

HEAVY DUTY
Lo-Hite Armoured Snaking Conveyor
Capacity—120 tons/hour

Length up to 180 yards according to h.p. and gradient. Power rating of 40-100 h.p. dependent on the number of standard units to be fitted which may vary from 1 to 2. A typical installation at a British Colliery has been operating successfully on an 180 yds. face with a single 40 h.p. unit, on a gradient of 1 in 9 against the load, and handling without interruption the output from a power-loading machine.

C.6 Lo-hite Armoured Conveyor, double strand 13 or 14 mm. chain:

Width 24½ in. . . Height 6 in.
Width 21½ in. . . Height 6 in.

C.5 Lo-hite Conveyor, double strand 13 or 14 mm. chain:

Width 24½ in. . . Height 5⅛ in.
Width 20½ in. . . Height 5⅛ in.
Width 16½ in. . . Height 5⅛ in.

Capacity—200 tons/hour

Length up to 400 yds., according to h.p. and gradient. Power rating of 40-200 h.p. dependent on the number of standard units fitted which may vary from 1 to 4.

A typical installation at a British Colliery is currently handling 1,000 tons per shift.

C.7 Extra heavy duty Armoured Conveyor, treble strand 18-mm. chain:
Width 36⅜ in. . . . Height 7⅛ in.
Width 30⅜ in. . . . Height 7⅛ in.

C.7 Heavy duty Armoured Conveyor, double-strand 8-mm. chain:
Width 24½ in. . . . Height 7⅛ in.
Width 21½ in. . . . Height 7⅛ in.

HIGH CAPACITY
RUGGED CONSTRUCTION
LOW MAINTENANCE COST

Maximum degree of snake to ensure moving over in the shortest distance, together with a high degree of lateral flexibility for undulating gradients. Alloy steel sprockets, giving long trouble free service. Various types of spill plates available to suit operating conditions. Special patented sectionalised pans for insertion at intervals in the conveyor run enable the pan line to be broken for inspection without breaking either top or bottom chain. Chain speed from 114 ft. to 185 ft. per minute to suit individual conditions. All types of conveyors can, at request, be supplied with N.C.B. recommended drive frame and gear boxes.

All Crawley Heavy Duty Machines have the following units standard and interchangeable:

DRIVE FRAME • GEAR BOX • GEAR ASSEMBLIES
EXTENSION SECTIONS • STRUCTURE • TAIL UNIT
CHAIN FLIGHTS

CRAWLEY INDUSTRIAL PRODUCTS LTD · LLANELLY
CARMARTHENSHIRE · S. WALES · Tel: Llanelly 4233

AYLING INDUSTRIES GROUP

CRAWLEY

RIGHT AT THE TOP...

for all-round performance

THE SHERPA

The SCAMMELL Sherpa 20 Ton Gross Dump Truck is an all-purpose vehicle with 8/10 cu. yd. capacity body, invaluable alike for on-site and on-the-road use. It is designed to give dependable service under the severest conditions, whilst retaining light enough unladen weight to allow maximum legal payload on the highway. Every Sherpa is backed by Cripps' unrivalled service. Working over the roughest country or along the finest roads —the Sherpa will make profit for you all the time.

CRIPPS

for SCAMMELL DUMP TRUCKS

R. CRIPPS & COMPANY LIMITED

SOLE CONCESSIONAIRES IN THE UNITED KINGDOM

NOTTINGHAM Telephone: 71161 MANCHESTER Telephone: Trafford Park 1658 SHILDON Telephone: 261

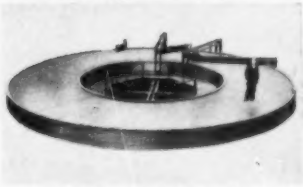
Established 1891 • Contractors to H.M. Government • You can rely on our service—proved over 60 years

Over 8½ acres

of specialised engineering facilities

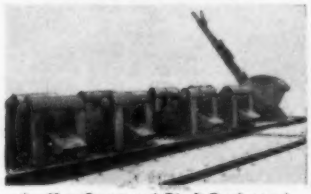
1. Conveyors and Bunkers.

Rigleys are a specialised organization for the design, fabrication and assembly of all types of structural steel work and ancilliary installations in and around collieries. The products are so diverse as to exclude a comprehensive listing but you can be sure that the Rigley facilities are much more than adequate for any undertaking in this field. Some standard items of manufacture are illustrated but it should be stressed that Rigleys thrive on the assignment where of necessity the installation or equipment must be "tailor made" to suit specific requirements. Their Engineers are always available in an advisory capacity.



2. Rotary Sorting Tables.

3. Complete Landsale Plants.



4. Kep Gears and Shaft Equipment.

RIGLEY

WILLIAM RIGLEY & SONS LIMITED
BULWELL FOREST · NOTTINGHAM
Telephone 278561

CARBLOX blast furnace linings—
proved throughout the world

Carblox have received orders for over 220 blast furnace linings. They are situated in 16 different countries, have diameters as large as 31 ft., and operate under greatly differing conditions.

Yet there have been no failures due to Carblox. This reliability is due to the fact that Carblox is specifically manufactured for blast furnace linings and has been proved over 19 years.

Detailed information and advice is freely available from Carblox Ltd. . . .

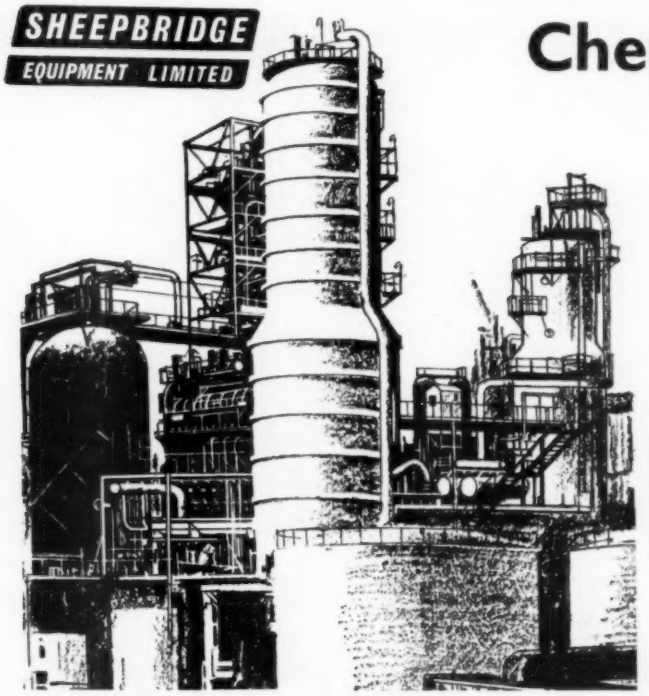
CARBLOX

STORRS BRIDGE WORKS,
LOXLEY, NR. SHEFFIELD.

one of the ***MARSHALL REFRACTORIES GROUP*** *of Companies*

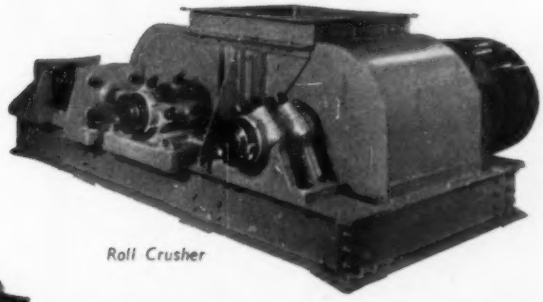
SHEEPBRIDGE
EQUIPMENT LIMITED

Chemical Plant

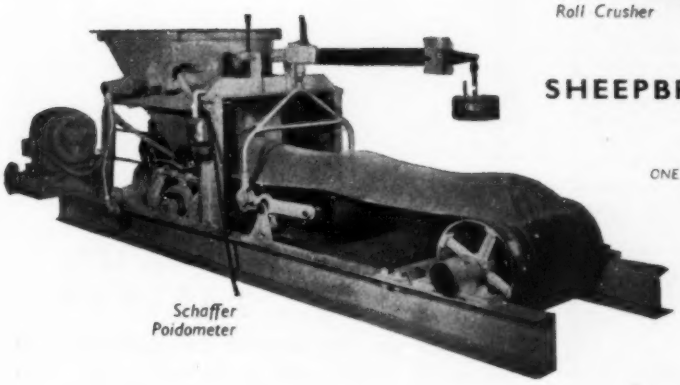


- Gyratory Crushers
- Roll Crushers
- Swing Jaw Crushers
- Cuber Crushers
- Schaffer Poidometers
- Ball and Rod Mills
- Chemical Handling Plant

Our Technical Staff is at your service. Write for full information.



Roll Crusher



Schaffer Poidometer

SHEEPBRIDGE EQUIPMENT LIMITED

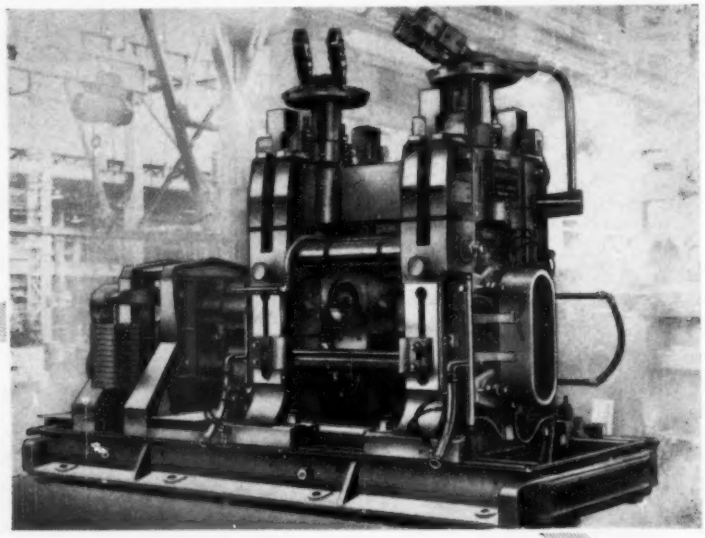
ONE OF THE SHEEPBRIDGE ENGINEERING GROUP

SHEEPBRIDGE WORKS

Chesterfield, Derbyshire

Tel: Chesterfield 5471

Telegrams: Sheepbridge Chesterfield



24" Section Mill Finishing Stand.

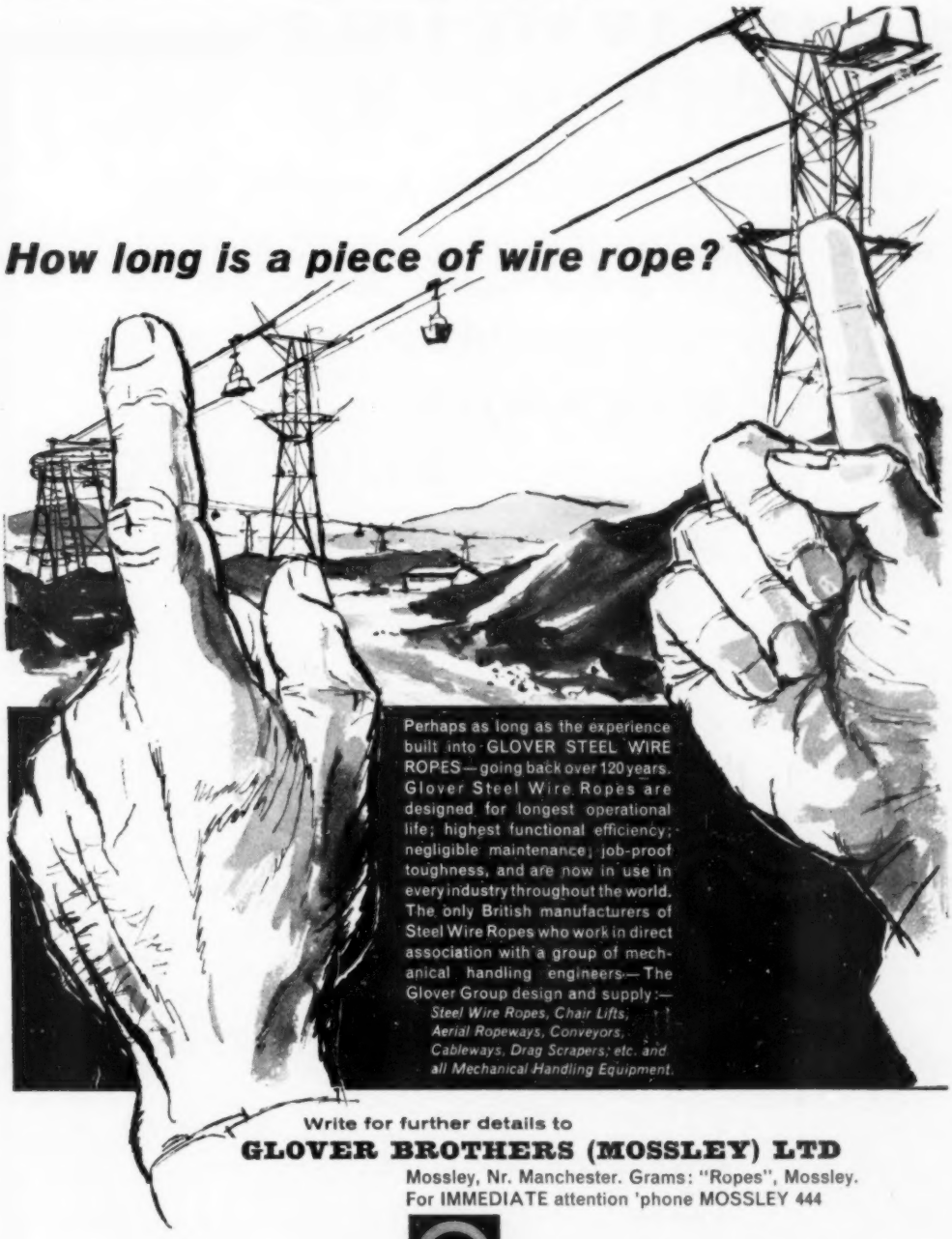
This mill and the roller tables were supplied for the DURGAPUR IRON & STEEL WORKS by—

ROBERTSON

Designed and built in collaboration with the main contractors, Davy and United Engineering Co. Ltd.

W. H. A. ROBERTSON & CO. LTD.,
BEDFORD, ENGLAND

LICENSEES FOR THE BUILDING OF SENDZIMIR COLD REDUCTION MILLS AND PLANETARY HOT MILLS, HALLDEN GUILLOTINE & ROTARY FLYING SHEAR MACHINES, & TORRINGTON METAL WORKING MACHINERY. WT.3398



How long is a piece of wire rope?

Perhaps as long as the experience built into GLOVER STEEL WIRE ROPES—going back over 120 years. Glover Steel Wire Ropes are designed for longest operational life; highest functional efficiency; negligible maintenance; job-proof toughness, and are now in use in every industry throughout the world. The only British manufacturers of Steel Wire Ropes who work in direct association with a group of mechanical handling engineers—The Glover Group design and supply:—

Steel Wire Ropes, Chair Lifts, Aerial Ropeways, Conveyors, Cableways, Drag Scrapers, etc. and all Mechanical Handling Equipment.

Write for further details to

GLOVER BROTHERS (MOSSLEY) LTD

Mossley, Nr. Manchester. Grams: "Ropes", Mossley.
For IMMEDIATE attention 'phone MOSSLEY 444

G

MEMBERS OF THE GLOVER GROUP:
British Ropeway Engineering Co. Ltd., Drag Scraper & Conveyor Co. Ltd., Glover Brothers (Mossley) Ltd., Wm. Jas. Glover & Co. Ltd., Ropeways Ltd.

* NOW AVAILABLE FROM STOCK

All prepublication orders for the 1960/1 EDITION of

RYLAND'S DIRECTORY

have now been fulfilled, and copies can be supplied immediately from stock

May we suggest you place your order at once with

The Publisher,
Ryland's Directory,
17/19 John Adam St.,
London, W.C.2

Price
84/-
(Post free in the U.K.)

Another

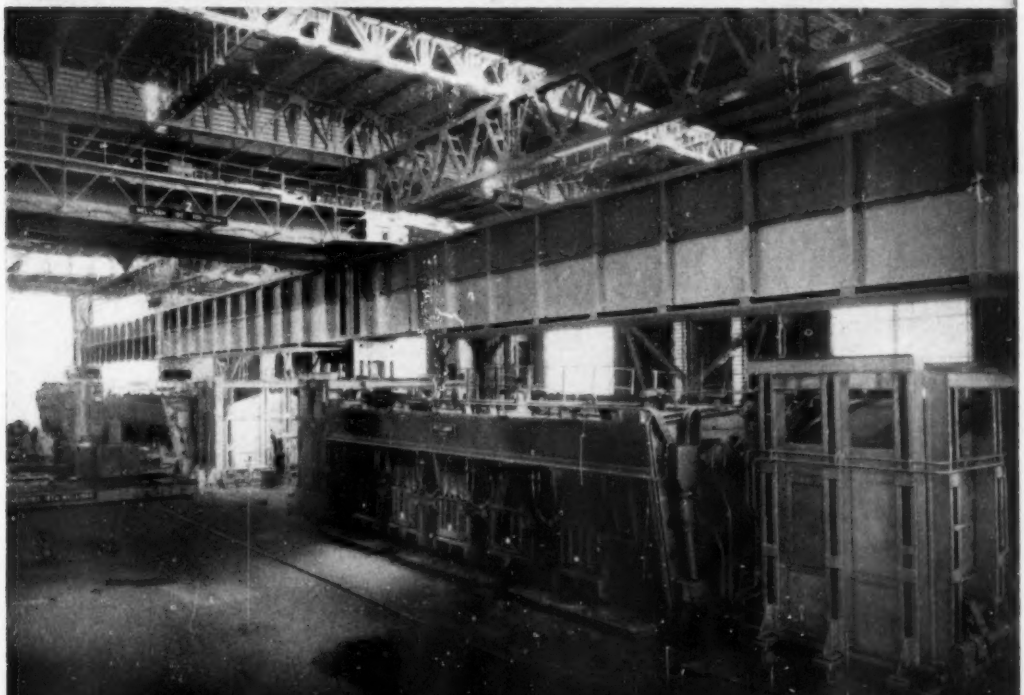
Wellman

Complete Steelworks Installation

Below is illustrated a complete Open Hearth Steel-Melting Shop designed and constructed by Wellman for Empresa Nacional Siderurgica S.A., Aviles, Spain.

This modern steelworks which marks an important step in the expansion of the Spanish Steel Industry includes: three 350-ton Open Hearth Tilting Furnaces, one 600-ton Active-type Metal Mixer, two 100-ton Hot Metal Cranes, two 4-ton Ground-type Revolving Open Hearth Furnace Chargers, two 140-ton Ladle Cranes, etc., etc.

Further orders have been received from these clients for Wellman Soaking Pits, Reheating Furnaces, Charging Machines, etc.



THE WELLMAN SMITH OWEN ENGINEERING CORPORATION LTD

PARNELL HOUSE, WILTON ROAD, LONDON, S.W.1 WORKS: DARLASTON, South Staffs, & BELFAST.

Safety with Economy...

Initial cost and maintenance lower than any comparable prop.

Fully approved by National Coal Board Approval No.H.7.

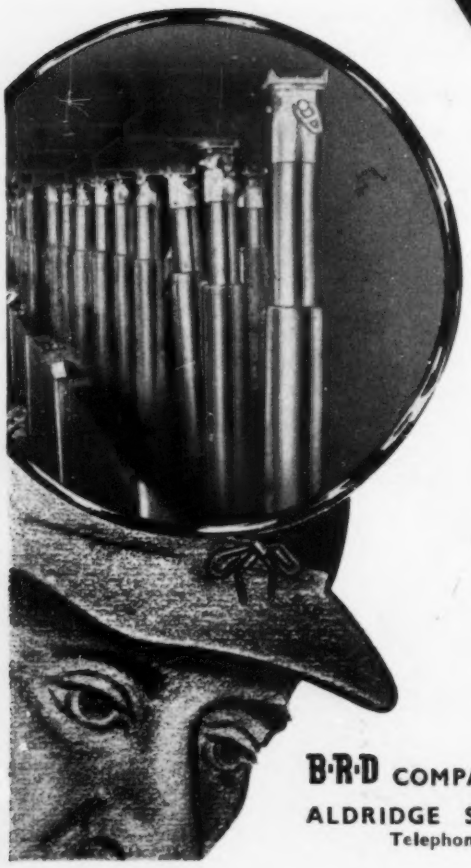
Write for illustrated brochure.

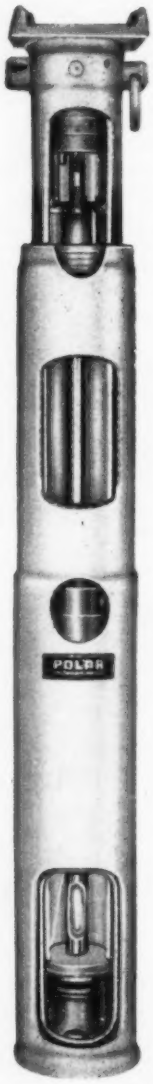
POLAR

hydraulic

props

by B·R·D

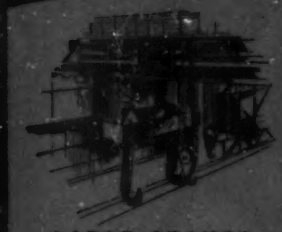




B·R·D COMPANY LIMITED
ALDRIDGE STAFFS ENGLAND
Telephone: Walsall 26551/9

A MEMBER OF THE GKN GROUP OF COMPANIES

STEELWORKS EQUIPMENT *by* ADAMSON-ALLIANCE



LADLE CRANES

SOAKING PIT CRANES

STRIPPING CRANES

CHARGING MACHINES

AA

ADAMSON-ALLIANCE CO. LTD.

71-4 MARK LANE · LONDON · E.C.3

Incorporating the Steelworks Divisions of

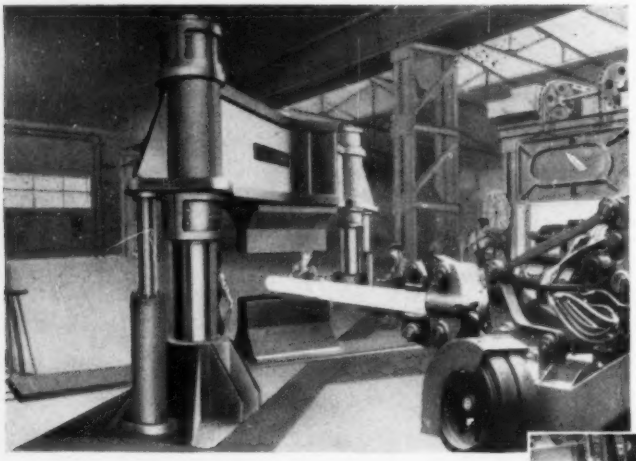
JOSEPH ADAMSON & CO. LTD. · HYDE · CHESHIRE

THE HORNSBY CO. LTD. · WELLINGTON · SALOP

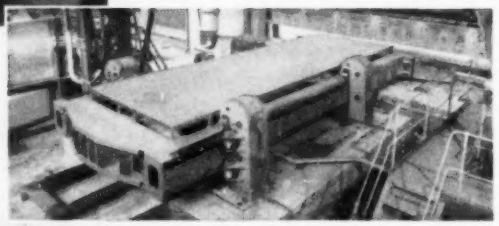
FIELDING

ENGINEERING SERVICE—

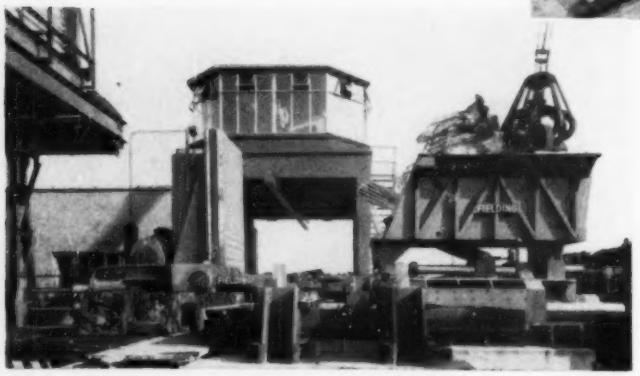
to the STEEL WORKS of the WORLD



FIELDING 1500 tons High Speed Two Column Pull Down Forging Press operating from a direct pumped Oil system. This design of press offers all the advantages of reduced head-room, increased stability, greater accessibility and the controls which are designed for either hand or automatic operation are suitable for integrated manipulator control.



A typical FIELDING 200 tons Self-Contained Hydraulic Furnace Pusher operating in a leading British Steel Works. Smooth build-up and release of hydraulic pressure is a particular feature of FIELDING Pushers resulting in reduced hearth wear.



This FIELDING Triple-Action Scrap Metal Baling Press produces bales weighing two tons each and machines of this type are installed in many of the larger Steel Works. A Wide range of FIELDING Scrap Presses capable of producing bales from 1 cwt. upwards is also available.

Other FIELDING Steel Works equipment includes Air Hydraulic Accumulators, High Pressure Pumps, Gag and Straightening Presses, Piercing Presses and in fact, any type of special heavy hydraulic equipment required by this industry.

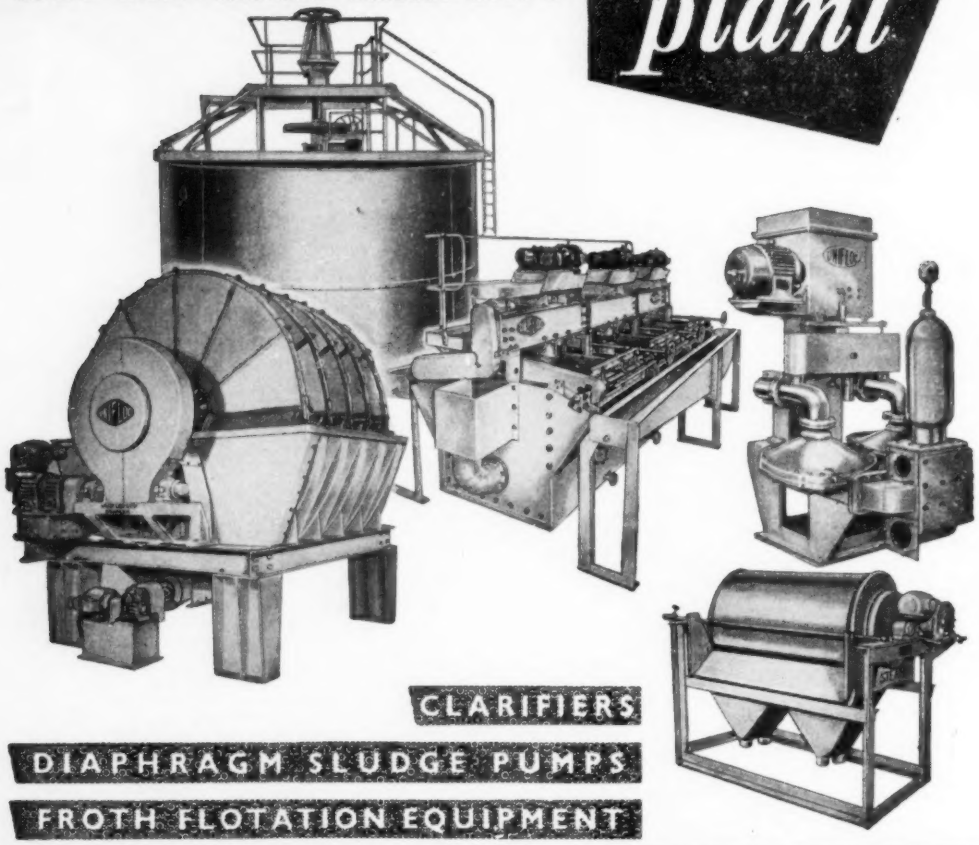
FIELDING & PLATT LTD. Engineers, **ATLAS WORKS, GLOUCESTER ENGLAND**

Telephone: Gloucester 20351 (6 lines) Telegrams: Atlas Gloucester Codes: A.B.C. 5th. Bentleys A.1

the answer
to every chain
question
IN THE RANGE FROM 5/32 TO 1 1/4 INCLUSIVE
Parsons
Chains
PARSONS CHAIN COMPANY LIMITED, STOURPORT-ON-SEVERN, WORCESTERSHIRE

CONFER WITH UNIFLOC ON PROBLEMS OF

WET MATERIAL HANDLING *plant*



CLARIFIERS

DIAPHRAGM SLUDGE PUMPS

FROTH FLOTATION EQUIPMENT

HEAVY MEDIA SEPARATORS · WET MAGNETIC SEPARATORS

DISC FILTERS · SLURRY PUMPS · ROTARY VACUUM FILTERS

THICKENERS

unifloc Contractors for complete process *plant*

✻ Test plant facilities available

UNIFLOC LIMITED, 11-16, ADELAIDE ST., SWANSEA TELEPHONE 55164

VEW

HOT BLAST

CUPOLA PLANTS for STEELWORKS

With our wide Continental experience based on over 75 years of Heat Exchanger Manufacture, VEW can offer Hot Blast Cupolas with melting rates from 1 ton/hr. to 50 tons/hr.

- For Acid or basic operation
- For high metal temperatures
- For low coke consumption
- For duplexing purposes

Over 100 VEW PLANTS
installed at home and abroad in

AUSTRIA
BELGIUM
BRAZIL
CZECHOSLOVAKIA
FRANCE
GERMANY
GREAT BRITAIN
INDIA
ITALY
JUGOSLAVIA
SWEDEN
SWITZERLAND
TAIWAN (FORMOSA)
TURKEY

VEW

HOT BLAST PLANTS
RECUPERATORS FOR FURNACES
FOR STEELWORKS

Write for full details to
Fuel & Metallurgical Processes Limited, Normanhurst Chambers, 21, St James Road, Dudley, Worcs.
GRAMS: FUEMETPROS DUDLEY. PHONE: DUDLEY 54649, 53751

F 12

for

FERROUS & NON-FERROUS

CASTINGS

For all Industries

Made
with the experience and skill gained by generations of craftsmen at the famous

DOWLAIS WORKS

Telephone: Merthyr Tydfil 2371

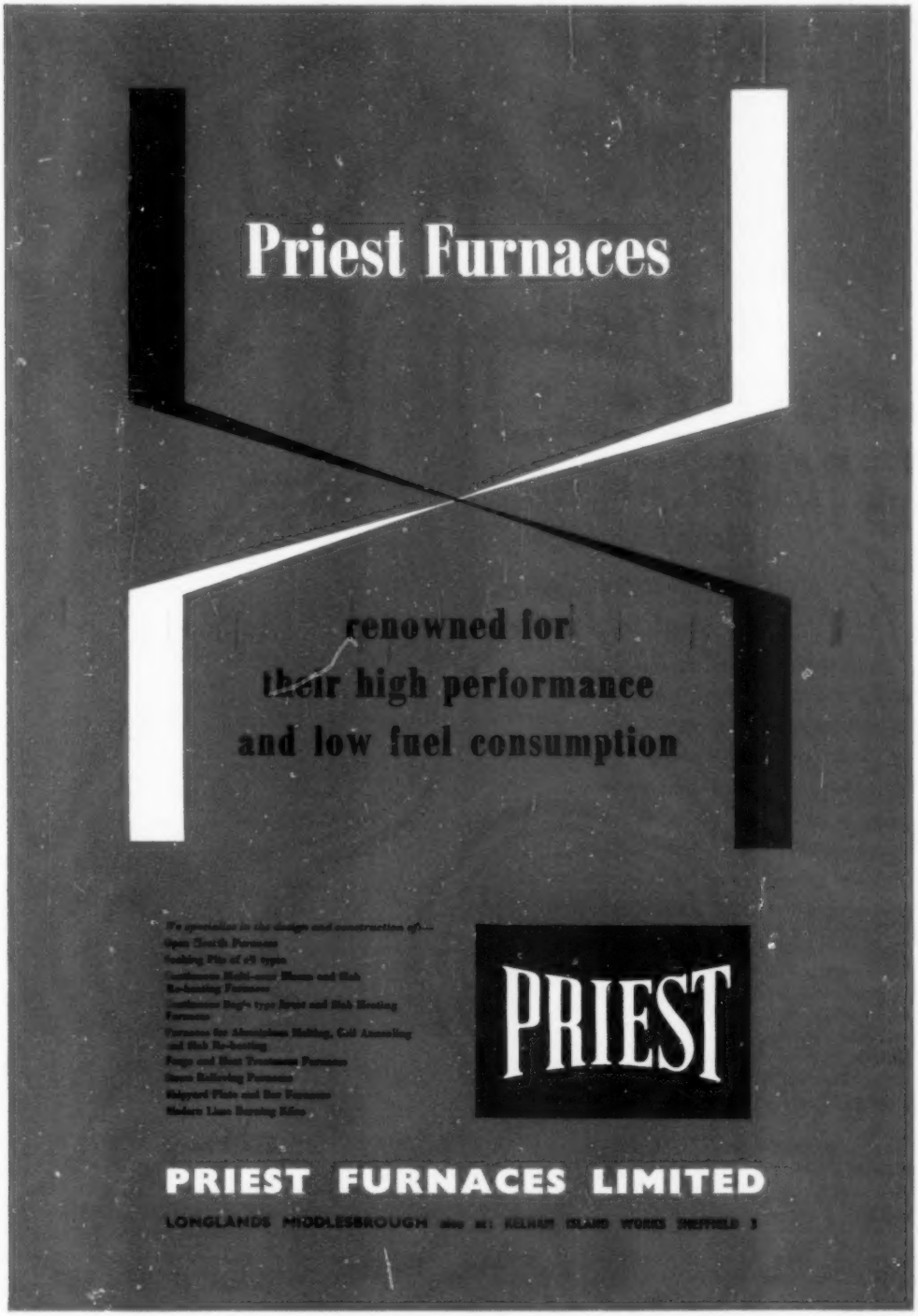
GUEST KEEN IRON & STEEL WORKS

(Branch of G.K.N. Steel Company Limited)

HEAD OFFICE

East Moors, Cardiff

Telephone: Cardiff 33151


Priest Furnaces
renowned for
their high performance
and low fuel consumption
PRIEST
PRIEST FURNACES LIMITED
LONGLANDS MIDDLESBROUGH also at: KELHAM ISLAND WORKS SHEFFIELD 3

F 162

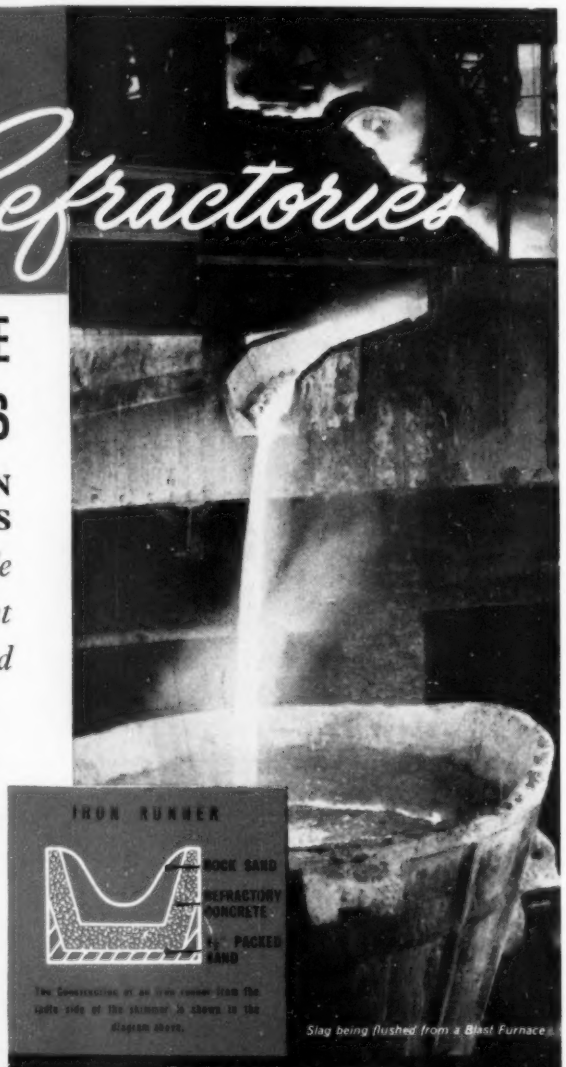
STEIN *Refractories*

CASTABLE REFRACTORIES

FOR BLAST FURNACE IRON AND SLAG RUNNERS

Made for durable service to a constant high standard

The illustration shows the use of Stein Refractory Concrete in a Blast Furnace Iron Runner from the ladle side of the skimmer. In this particular installation the full 30 ft. length was cast at one time using a former 4 ft. long, the whole operation taking 2 hours to complete. Runners from the slag notch have also been cast in Stein Refractory Concrete.



Slag being flushed from a Blast Furnace

Stein Refractory Concrete is also used for forming special shapes in moulds or in situ, e.g. burner quarls, baffles, dampers, sight-hole blocks, etc. Also for monolithic linings such as soaking pit covers and furnace door linings.

You are invited to consult our long experience on all refractory problems.

TECHNICAL DATA

	How Supplied	Type of Set	Refractorines	Thermal Hardening Temperature	Max. Temperature of use	water addition for casting per 1 cwt. concrete gals.	water addition for ramming per 1 cwt. concrete gals.	Approx. weight required per cubic ft lbs.
Stein Refractory Concrete No. 13	Dry	Hydraulic	1420°C	1200°C	1350°C	2¼	1¼	120
,, No. 14	Dry	Hydraulic	1500°C	1200°C	1450°C	2⅛	1⅛	120
,, No. 16	Dry	Hydraulic	+ 1750°C	1200°C	1600°C	1⅝	1	160
,, No. 17	Dry	Hydraulic	+ 1750°C	1200°C	1700°C	1½	1	160
,, No. 18	Dry	Hydraulic	+ 1750°C	1200°C	1800°C	1½	⅛	160
Stein Chrome Concrete	Dry	Hydraulic	1750°C	1200°C	1500°C	1⅛	⅛	180

JOHN G. STEIN & CO. LTD., Bonnybridge, Scotland. *Telephone: Banknock 255 (4 lines) 361 and 362.*

Vol. 183
No. 4851

IRON & COAL

THE IRON AND COAL TRADES REVIEW

JULY 7, 1961

ESTABLISHED 1866
Incorporating "STEEL and IRON" and "COAL"

Organ of the National Association of Colliery Managers and the Association of Colliery Managers in India

Published each Friday

Annual Subscriptions: United Kingdom....52s. Abroad....60s. Payable in advance.

Editor:
F. H. HARLEY

Assistant Editor:
P. E. CARDEN

Metallurgical Editor:
C. W. J. CRAWFORD, A.I.M.

Mining Editor:
H. COOPER, A.M.I.MIN.E.

News Editor:
R. M. HOWSE

Associate Editors:
J. J. CALEY and B. M. DAVEY

District Representatives:

E. G. COLLIS (Southern) Tel.: TRAfalgar 6171

A. D. H. CURRIE (Northern) Tel.: Ringway 2452

E. J. SWEETING (Midlands) Tel.: Plumtree 2585

T. H. SMITH (Scotland and N.-E. England) Tel.: Dumbarton 1046

Production Manager:
R. J. LOVELL

Publisher:
H. J. DWYER

Circulation Manager:
E. T. GRIFFITHS

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published by
INDUSTRIAL NEWSPAPERS (FUEL & METALLURGICAL), LTD.

Directors:
F. BARRINGTON HOOPER *Managing Director*
F. H. HARLEY
JOHN HOOPER
V. C. FAULKNER
E. G. WESTON, *Secretary*

JOHN ADAM HOUSE, 17-19, JOHN ADAM STREET, ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 (Private Branch Exchange)
Telegraphic Address: "Zacatecas, Rand, London."

In this Issue—

CLEAN AIR IN THE STEEL INDUSTRY
High Aim for Oxygen Steelmaking - - - - page 11

THE ARMSTRONG AIRBREAKER
Operational Results at Shirland Colliery - - - page 15

HYDROGEN IN BASIC O-H STEELMAKING
Influence of Gas and Tar Oil Firing - - - page 27

IN THE STEPS OF JAMES BRINDLEY
Underground Waterways at Worsley - - - page 34

QUARRYING IRONSTONE AT CORBY
Progress Report from Cowthick Quarry - - - page 37

	PAGE
Leading Article: The Coal "Image"	1
Over 50 Years in Mining	2
Passing Thoughts	2
"Bluntly and Frankly"	3
Obituary	4
Colvilles' Rights Issue	5
Dickson & Mann Expansion	5
Appointments	6
Pit Strikes Condemned	7
Personal	8
Sheffield Honours Scientists in Fuel and Metals Fields	8
ECSC Coal Outlook	9
Sir John Charrington's Tribute to Coal Board	9
Orders Placed	10
Coalite and Chemical Expansion Plan	10
Karachi Steel-mill Project	13
Metallurgical News from Russia	13
H.E.R.O. Reactor Vessel	14
Oxygen-refined Ferro-alloys	14
Chain-link Normalizer	14
Twisting Conveyor Belt in the US	25
Valuation of Work in Progress	26
Forthcoming Events	26
British Iron and Steel Industry Translation Service	32
Atmospheric Pollution	33
New Mechanical Research Laboratory for C. A. Parsons	33
Loader to Meet Mining Conditions	35
New Literature	36
The Patent Office in 1960	38
Steel Sidewall Panels Assembled During Erection	38
Accidents at North-Western Collieries	39
Book Review	40
Metallurgical Patents in the US	41
Furnace Installation Problem Overcome	42
Exhibition of USSR Products	43
In Parliament	44
Iron and Steel Trade	45
UK Price of Nickel Raised by £60 a Ton	45
Iron-ore Imports	45
Coalfield News	46
Lord Robens Talks to Miners on Haig Pit Development	46
The Coal Trade	47
Coal Stocks Fall to 23,141,000 Tons	47
Board Changes	48
Company News	49
Davy-Ashmore Profits Exceed £4,000,000	50
Edgar Allen Fails to Maintain Profits Increase	50
Law Cases	51
Advice on Setting Up Oversea Factories	52
NCB Contracts Out of State Pension Scheme	52
Expansion by Belgian Steel Industry	54
Increased British Trade with East Germany	54
Dorman Long Board Changes	54
Steelworks Plan for Brazil	54
News in Brief	56
Current Prices of Iron and Steel	58

Photo by courtesy of Fibres Division, Imperial Chemical Industries Ltd. Manufacturers of 'Terylene' polyester fibre.

G IS FOR CONVEYOR BELTS at a new I.C.I. plant in Cheshire, where eight Goodyear belts of rubber and 'Terylene' carry coke, burnt lime and coke/lime mixture. 'Terylene' was chosen for its flexibility and strength, which allows exceptionally deep troughing so that deck plates, skirt boards, etc., are eliminated and idlers can be spaced 50% wider apart. 'Terylene' also withstands the heat of the coke (carried at up to 120°C), is rotproof and resists moisture penetration. For the *right* conveyor belt, installed in the *right* way and maintained in the *right* manner, contact Goodyear Industrial Products Division at Wolverhampton.

GOODYEAR **THE GREATEST NAME IN RUBBER**

The Goodyear Tyre & Rubber Co. (G.B.) Ltd., Industrial Products Dept., Wolverhampton. Export Enquiries: 17 Stratton Street, London W.1

IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 183 July 7, 1961 No. 4,851

The Coal "Image"

SUCCESS comes to some people quicker than it comes to others, and it is a sad commentary on the modern view of life in this age of full employment to have to add that the yardstick by which one man's success is measured in the minds of others is the amount of money he has made. One man will climb Mount Everest, another will become an archbishop, and yet another by devoted research and dedicated labour will make an advance in medical science which brings new hope to millions; but in the eyes of the multitude —even more in 1961 than when Galsworthy was producing his literary masterpieces—it is the man of property who is the real "success."

As with the individual, so with industry. The successful industry is the one that makes money, and so, of course, it must be. All industries ought to pay their way. Agriculture does not, and as a result it has to be subsidized by the public who are its customers, but we have not reached the stage where the public is ready to declare every unprofitable industry a national asset and therefore entitled to draw unrestrictedly on the national exchequer. There are people who argue that we should do just that, but they have not yet succeeded in selling their particular brand of ideology to the mass of the people. When we are told that we all have to live on taking in one another's washing, someone inevitably wants to know who is going to produce the clothes to send to the wash, and the soap to wash them with.

The coal industry still has not reached the point where it can produce the financial balance-sheet that would enable it to acclaim itself as a success. Last year the National Coal Board sustained a loss of over £21,000,000, and it now faces an accumulated deficiency of nearly £78,000,000. The board is not required to make a profit; it is supposed to break even over a period. With losses on the scale of those of recent years the period will obviously be a protracted one, and, understandably, the members of the board are not satisfied with the position. "We must pay our way," its deputy-chairman declared recently; and: "It is of no use producing coal unless we can sell it commercially at a profit," the chairman of the board said about the same time. Financial stability of the industry within a reasonable period is the aim of the board, and that stability is not to be achieved by sacrificing the consumer on the altar of price. It is to be reached through greater productivity, which is the only way to turn losses into profits without raising prices.

The difficulties, failures, shortcomings, achievements, and hopes of the board were surveyed by the chairman when he introduced the 1960 report of the Coal Board a few weeks back, but for a true appreciation of the problems which beset the industry it is essential to study the report in detail. A recurring criticism of the board is that it fails to operate as a "commercial" enterprise, and a recommendation often made is that it should effect any reduction in output it requires by shutting down uneconomic pits. The board is in fact doing this where it can, but it has social obligations, also, and the report shows just how extensive these obligations are.

In 1960 only the North-Eastern, East Midlands, and West Midlands divisions of the National Coal Board made a profit—before charging interest. If it is argued that only these divisions be kept in operation, then it must be pointed out that together they employ only 261,000 of the 602,000 wage-earners on colliery books in 1960, and the other 341,000 men would have to be found other employment or become a burden on the community. Moreover, they produced only about half of the total production of coal last year, and to rely on these three divisions alone would have meant the country being short of some 85,000,000 tons of coal production.

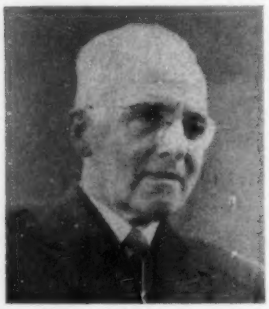
Of course this is oversimplification and to achieve financial stability by such means would never even be contemplated; if it were, the proposal would create a furore throughout the country, even among the severest of the industry's critics. To mining men the facts and figures are so well known that to call attention to them in IRON AND COAL is as idle an argumentative exercise as setting up little wooden men and knocking them down again. But, unfortunately, so many of coal's critics speak without the book. Only this week, in a part-programme which plumbed a new low in inanity, Lord Robens was asked on television if he did not think the thing to do was to close down pits which did not pay. His answers to these and other queries were models of commonsense and restraint, but what a pity it is that whenever coal becomes a subject for comment in the newspapers or on the air the same old questions should have to be asked and answered.

Few industries, if any, produce such a mass of statistical detail about their operations as does the coal industry, yet about no industry does the public seem to be so ill-informed. If only a new "image" of coal could be created in the public

mind the task of the National Coal Board would be much easier, and those who work in the industry would be enabled to carry out their several tasks in a more serene atmosphere. Public ignorance about coal is perhaps the industry's greatest enemy, and ignorance unfortunately breeds indifference. In selling coal the NCB has at the same time to "sell" the industry. And not only to the public. In some of the coalfields, also, if the first part of the television programme mentioned is to be taken as a guide.

Over 50 Years in Mining

AFTER 51 years in the mining industry, Mr. Sam MacDonald, head of the training branch, industrial relations department, Scottish Divisional Coal Board, has retired. He began work at the age of 14 with William Finnie & Company, Limited, coalmasters, of Kilmarnock.



MR. S. MACDONALD

In order to fulfil his ambition to become a colliery manager, he studied at evening classes and Kilmarnock Technical College and, after nine years, during which time he passed through various grades of underground employment, he obtained, when he was 24, his 2nd class Certificate of Competency. A year later he passed his colliery manager's examination. Within a month Mr. MacDonald was appointed undermanager with J. & R. Howie, Limited, colliery owners, firebrick and fireclay manufacturers, of Hurlford (Ayrshire). The following year, 1922, he was promoted manager of a group of collieries in the Crosshouse/Springside Area and held the position for the next 22 years.

Shortly after his resignation in 1944 to become manager of the Balgray Bauxite Company, Limited, Kilmarnock, Mr. MacDonald was injured in an accident. Chafing with the enforced and unaccustomed inactivity, he enrolled as a student at Nuneaton Staff College, where, eventually, he became a lecturer, continuing in that position until the college closed in 1949. Later that year he was appointed assistant education and training officer at the headquarters of the Scottish Divisional Coal Board and, in 1958, he became head of the department from which he has just retired.

HIGH AUTHORITY of the European Coal and Steel Community announces from Luxembourg that it has taken a decision, details of which have not been made known, on the following ECSC investment plans:—Building of an electro-furnace by the refined steelmaker Deutsche Edelstahlwerke (West Germany); building of an oxygen steelworks by Espérance-Longdoz (Belgium); and modernization and extension of two hot-rolled wide strip units, also by Espérance-Longdoz.

Passing Thoughts . . .

IN spite of all foreign competition, together with production difficulties bedevilling the efforts of the salesman, the reputation of Britain to produce the right goods, visible or invisible, together with an honest contract for their sale, still stands in high regard even in some very unlikely areas. What is needed to maintain and expand this state of affairs is a real sense of urgency in the daily way of thinking of more UK producers and their employees—perhaps particularly the latter.—Letter in The Times.

It is unrealistic to expect manufacturers in this country to export more unless they have not only a reasonable expectation of getting paid for what they sell but also of securing some margin of profit.—MR. J. L. S. STEEL, *chairman of the British national committee of the International Chamber of Commerce.*

Managements are responsible for more strikes than trade unions. Instead of maligning the trade unions for the number of strikes we must malign the employers for living in Victorian days instead of in the modern age of democratic understanding. There has got to be a straight talk between the TUC and the British Employers' Confederation to see if we can't ease some of their managerial functions.—MR. TED HILL, chairman of the TUC, addressing the mineworkers' annual conference.

Mr. Ted Hill, the chairman of the TUC, made a speech to the mineworkers yesterday on unofficial strikes that was a model of irresponsibility. . . . He belongs, like the employers he was criticizing, to a past age. Bernard Shaw might have invented him.—Daily Herald.

The average businessman has quite inadequate holidays. It is a great myth that people can work for 48 or 49 weeks a year and then do with only a couple of weeks' holiday. For most people, two holidays or even three, are better from a health point of view.—DR. H. B. WRIGHT, medical research unit of the Institute of Directors, speaking at a dinner of the Northern Ireland branch of the institute.

A promise is a promise, but too often it is not regarded with sufficient sanctity. If you applied the same standards in domestic life everything would go haywire. The Sunday joint would be delivered on Monday afternoon.—MR. H. F. SHERBORNE, *managing director of Yorkshire Imperial Metals, Limited, referring to delays in export deliveries.*

The financial inability of the [railway] industry to pay higher wages cannot be accepted as a reason for refusing a justifiable claim.—MR. W. H. RATHBONE, president, National Union of Railwaymen.

The Chancellor has armed himself with some so-called regulators which may well become paralysers.—SIR WALTER PUCKEY, *chairman of the British Institute of Management conference, at Harrogate last week.*

It's 18 years since I last touched my tools, but I think that with my experience of industrial negotiations most employers would be delighted to have me as a shop steward.—MR. FRANK HAXELL, former general secretary of the Electrical Trades Union.

I would rather have a good-mannered dunce than a bad-mannered mathematician.—MR. HUGH CAMERON, *district sales manager, United Steel Companies, Limited, speaking at a school speech day.*

"Bluntly and Frankly"

LORD ROBENS' ADDRESS TO NUM

MAIN function of a trade union is to secure the maximum wages and the best conditions of work that it can for its members. Now I happen to want exactly the same thing for British miners," said Lord Robens, making his first address in his capacity as chairman of the National Coal Board, to the annual conference of the National Union of Mineworkers at Rothesay yesterday (Thursday). Concluding, Lord Robens said he hoped he had laid some of the ghosts, shown the road to the future and helped to make possible the realization of the industry's objectives through greater co-operation.

Lord Robens asked his audience to "face the facts of life"—British industry was no longer a captive market for coal; the day had gone when increasing cost could be retrieved by adding to the price of coal. Oil, natural gas, liquified methane, and nuclear power were alternative sources of energy and the big consumers would turn to those fuels which kept the cost of manufacturers' products down.

He went on to tell the conference "bluntly and frankly" where the industry now stood. Taking into account the effects of the increase in coal prices and the tax on oil in the last Budget, the position was that about 12,000,000 tons of annual sales were now at risk because consumers in general industry were seriously thinking of turning over to oil. That figure represented the average of nearly 50,000 men in more than 40 average-sized pits.

Must Ensure Stable Prices

The industry's competitive position was affected above all by two factors—the straightforward comparison of the cost of coal and oil on the basis of the amount of usable heat they contain, and the fears of consumers that coal prices will continue to rise in the future as they have done in the past. They could just about meet competition on a cost basis in almost all parts of the country, but the second was the point upon which the whole situation hinged, and it was absolutely essential to the future of coal that they should be able to convince customers that they could maintain stability of prices. The one sure way was to be able to sign long-term contracts, and that must be their aim.

They could ensure stable prices, and at the same time improve wages and conditions, but only by increasing efficiency—increasing mechanization throughout the pits and making it pay off, and getting the full results from new and reconstructed pits which in 1965 would represent 80 per cent. of output capacity. A fundamental problem was manpower.

It was quite certain that in the future there would be very great incentives to attract men away from the less socially convenient occupations to the well-paid jobs in clean comfortable factories with all the best working facilities. But there would still remain a national need for coal and enough men to produce it. The answer was clear—mining must be made more attractive. The answer was not simply to increase wages. Last year more than 15,000 miners left jobs in the industry in which they could have earned £1,000 a year or more, many of them for jobs in other industries which paid lower wages but offered better working and social conditions. Should they not be thinking of ways in which it would be possible for a man to retire on a decent pension at 65, of bringing the retiring age gradually down to 60, and of increased leisure—either in the form of a shorter working week or of extra holidays?

In giving 15 minutes off the shift time and a substantial rise for daywagemen, the board was mortgaging in advance the benefits it hoped to get in the course of the year from increased productivity, but it was as keen as the union to see improvements in conditions. "We are not against great reforms—indeed they are very desirable. The point is, can the industry grant them and retain its present size? I believe that really revolutionary advances are possible, if we work together to provide them," said Lord Robens.

Such improvements could not be made overnight—to do so would just be to hand their markets over to oil and imported natural gas on a platter. Improvements would come with the speed with which the efficiency of the industry was improved—"and the hurdles are not high," he said. There was an enormous range of efficiency between the most successful pit and the worst—from a profit of £2 5s. per ton with an OMS of 56 cwt. to a loss of £6 10s. and an OMS of 11 cwt. "If the industry were so small as to be confined to Yorkshire and the East Midlands with an output of 84,000,000 tons in 1960 and profit of £22,000,000 after interest, we could provide the Mineworkers' Charter tomorrow for those miners without increasing prices," he said.

But they had to carry the losing divisions and the principle of uniform conditions over the whole country—a policy he accepted completely. Therefore, successful mechanization was essential to the future of the industry. "It is the key to our prices, the way to keep down operating costs, the way to maintain manpower, and the answer to some of the problems of making mining safe."

In 1961 they were taking a great leap forward by installing 400 new power-loading machines and would reach 50 per cent. of output power-loaded by the end of the year. By the end of May 137 machines had already been installed and 47 per cent. of output was now cut and loaded mechanically, compared with 42 per cent. at the end of 1960. The ultimate objective must be complete mechanization wherever technically possible—technical experts said this could take them up to 80 per cent. of total output.

The machines must also be used to the full to get the maximum return on investment. The cost of mechanizing a 200-yd. face with power-loading machine, powered supports, and conveyor, was about £100,000. It is, therefore, essential to keep as low as possible the machine time lost in stoppages by proper co-

ordination of the coal-getting operations and maintaining all equipment to the highest possible standards.

Machines should operate wherever possible on two or three shifts. Latest figures showed 694 machines operating on a single shift basis, 621 on two shifts and only 114 on three shifts. An example of what could be achieved was provided by a face at a colliery in the North-Eastern Division where, using an Anderton shearer loader in a 3-ft. seam on three shifts a day, an average face OMS of 345 cwt. was achieved in the first quarter of the year.

Increased mechanization was not the only way to reduce costs—voluntary absenteeism at the face was a very heavy cost. Today it was running at a rate which meant that each face worker in the industry was only working effectively about 4½ days a week. The loss of output that represented meant an additional charge on the industry of something in the region of £40,000,000 a year. "Those who voluntarily take time off are reducing the ability of the industry to meet claims for improvement in wages and conditions of all," Lord Robens commented. The greatest waste of all was unofficial disputes and stoppages. In 1960 1,500,000 tons of output were lost, amounting to an additional charge on the industry of some £3,000,000. "Unofficial stoppages make nonsense of the industry's conciliation machinery, which is probably the finest of any industry in this country. Strikes in a nationalized industry settle nothing, we still at the end have to sit down at the table and negotiate. . . . I would have thought that by this time, 14 years after nationalization, there should be no problem between managers and men that could not be settled by negotiation within the agreed structure," he said.

Referring to decentralization, Lord Robens said the word had acquired political overtones which made it rather an obscene word to use in that company. "I want to kill the suggestion that there is a secret plan to return to pre-war conditions with district wage agreements. There is no such plan. Neither I, nor my colleagues on the board, have ever considered such a plan; nor do we intend to do so. Any suggestion on these lines can only undermine the morale in the industry and I therefore want to make the position perfectly clear with all the authority I possess," he said.

The principle of decentralization of administration was clear: no administrative task that could be efficiently and sensibly done at a lower level should be done at a higher level. The reins from Hobart House must be gradually loosened to free the initiative and energies in the divisions, he concluded.

NCB Marketing Retirement

RETIREMENT took place last week of Mr. James I. Willis, deputy director-general (sales), marketing department, National Coal Board, who has spent almost 50 years in the coal trade and industry. Mr. Willis, who was 65 on Monday, is a Tynesider. Until 1936, when he became executive officer of the Durham Sales Control Committee, he was a coal exporter and distributor on Newcastle's Quayside. In 1941, he became a member of the control committee.

On nationalization of the coal industry, Mr. Willis was appointed marketing manager of the Northern Division. He went to Hobart House, London, in 1948 as assistant to the deputy director-general (sales) in the marketing department, and, in 1955, succeeded Mr. R. H. E. Thomas as deputy director-general.

Obituary

MR. B. WELBOURN

ONE of the men who, in the 1890s were responsible for shaping the British electrical industry in its early years, Mr. Burkewood Welbourn died on Saturday aged 85. He studied electrical engineering at King's College, London, and graduated in 1896. His first post in industry was as works manager to the Electrochemical Company, Limited, St. Helens, and in 1900 he became contract manager of the British Insulated Wire Company, Limited, the forerunner of British Insulated Callender's Cables, Limited.

Responsible for the installation of the whole of the company's products all over the world, Mr. Welbourn, when still in his 20s, travelled all over Europe, Russia and North America. As a consultant he pioneered the use of electricity underground in the collieries of south-west Lancashire. In the ensuing years he became chief engineer and a director of BI, vice-president of the Institution of Electrical Engineers, and one of the leading men in his particular field.

The death occurred last Sunday, while on holiday, of Mr. J. HUTCHISON of the publicity department of Mavor & Coulson, Limited.

The death occurred recently, at the age of 73, of Mr. ERNEST EVANS GREAVES, formerly chief order clerk with the Chesterfield Tube Company, Limited, which he served for 42 years.

The death has occurred in Johannesburg of Mr. THOMAS GARFIELD BENNETS. He was 54. Born in Britain, he was well-known in South African and UK mining circles and designed a new thruster rig for mining which received a Blue Riband award in America.

For many years joint managing director and secretary of W. Crockatt & Sons, Limited, engineers and gear cutters, of Glasgow, Mr. PETER WILSON died on Sunday. He was also chairman of J. G. Jackson & Crockatt, Limited, mechanical and chemical engineers, of Glasgow.

Powell Duffryn Forms New Heating Company

NEW company which will provide increased facilities for the expanding heating industry in the UK is the latest step by Powell Duffryn, Limited, in its programme in the field of heating and air treatment. To be called Powell Duffryn Heating, Limited, this company is from July 1 operating the business previously conducted by Janitor Boilers, Limited, Hurseal, Limited, Gulf Radiators, Limited, and Powell Duffryn Modulair, Limited.

The board of the new company comprises, Mr. M. Reid, chairman, Mr. A. C. Hazel and Mr. K. M. D. Johns (joint managing directors), Mr. R. C. Saloway, Mr. R. Turner, Mr. H. H. Hollesen, Mr. R. H. Stewart, Mr. W. H. Sharland, and Mr. E. B. Overton.

BRITISH STEEL CONSTRUCTIONS (BIRMINGHAM), LIMITED—Mr. G. Marks has been appointed to the board.

Colvilles' Rights Issue

LESS RELIANCE ON BORROWED FINANCE

BY a rights issue of 5,324,906 £1 ordinary shares at 57s. 6d., Colvilles, Limited, Glasgow steelmakers, is to raise just over £15,250,000. On the purpose of the issue the official statement explains that the total of about £83,000,000 to be spent on capital schemes already authorized (principally in connection with the strip mill project at Ravenscraig) could have been financed by bank facilities, accruing resources, and the £50,000,000 Government loans approved in September. The directors, however, consider that they should not rely too heavily on borrowed money and temporary finance but should take an early opportunity of raising permanent capital.

Under the agreement with the Minister of Power, the Government agreed to make available up to £50,000,000 for the strip mill by way of loans on terms which provide that the payment of interest may be postponed until the new plant is in operation and for a further three years thereafter. The first instalment of £15,000,000 was drawn in March. The rights issue will enable Colvilles to reduce the amount of money which it will need to call on the Government to lend under the agreement for the finance and also reduce reliance on bank facilities as other development schemes approach completion.

Rights to ordinary shareholders are on a three-for-eight basis and to the 6 per cent. convertible debenture 1978/81 stockholders on a basis of 99 shares for £400, the effective date in both cases being June 16. Payment is 30s. by August 16 and 27s. 6d. by September 21. Provisional allotment letters are to be posted on July 21 after an extra-ordinary meeting to create 10,000,000 £1 shares.

Difficult to Forecast Results

A 6 per cent. interim has already been declared, payable July 31, and the board is confident the final dividend will be 10 per cent. on the increased capital. The directors find it difficult at this stage to forecast accurately trading results for the year to September, 1961, but they expect profits, after depreciation and taxation but before any transfer to capital reserve, will not be very different from last year's figure.

A number of conflicting short-term influences, they continue, will affect profits for the two years to September, 1962 and 1963. On the one hand, there will be the cost of running in very large new items of plant, profits from which cannot be expected to cover increased depreciation and the cost of borrowed money. But the cost of interest, it is pointed out, could be eased as the company can exercise its right to postpone paying interest on the Government loan. On the other hand, the company should benefit by a reduction in tax provisions due to large capital allowances on the new plant.

What the net effect of all this will be on profits, they state, cannot be reliably estimated. But they expect to maintain their dividend policy even if it means a temporary reduction in the dividend cover because of these short-term influences.

ALLOY STEELMAKERS, G. L. Willan, Limited, Sheffield, propose to erect a new factory on a two-acre site near Rotherham.

Dickson & Mann Expansion

MORE jobs, greater output in the near future, and a break into the export market will be the effect of an extension to the steelworks of Dickson & Mann, Limited, colliery and structural engineers, steel founders, coal screening and handling plant manufacturers, of Armadale (West Lothian). The new extension, which represents an increase of one third in the floor space of the works, was opened last Friday by Lord Polwarth, chairman of the Scottish Council (Development and Industry) and marks the end of two years' diversification and expansion by the firm.

The introduction of light material handling equipment for factories and industrial processes of all kinds has brought the company outstanding success. "We expanded so rapidly that the existing works proved quite inadequate to meet demand," said Mr. C. C. Bewsher, the chairman. "Not only have we built the extension, but we have already had to increase our labour force by about 25 per cent. and there is little doubt that we will be providing jobs in even greater numbers in the future."

Founded in 1895, Dickson & Mann established the first steel foundry in the Lothians. Eighteen months ago a subsidiary company, Mann (Handling), Limited, was formed for the marketing of its products.

South Durham Steel Men on Short Time

ALTHOUGH some men employed at the South Durham Steel & Iron Company's new £53,000,000 steelworks at Greatham (Co. Durham) are to be laid off and others went on short time from the beginning of this week because of a recession in the industry, Mr. T. J. Williams, group general manager, said there would be no major redundancy.

In the slabbing mill, where there has already been a cut from 17 to 15 shifts per week, one further shift is to be dropped and there is also to be a reduction from 17 to 15 shifts in the plate mills.

The lighting of a further battery of 26 coke ovens at the new plant, Mr. Williams said, was an act of faith in the future of steel, despite current difficulties. The ceremony, which was performed by Mr. Williams, marked the last phase of a £3,400,000 contract for the three batteries of coke ovens, a by-products plant, and a coal-handling plant.

Appointments

Consultant to Holman Group Companies

DR. H. J. PHELPS, who has been appointed consultant to two of the companies in the Holman Bros. Limited, group, Camborne (Cornwall)—Maxam Power, Limited, and Goodyear Pumps, Limited, is a scholar of Trinity College, Oxford.

During the war he served with Economic Intelligence and was later Deputy Controller in the department of military government dealing with the chemical industry in the British Zone of Germany. In 1946 he joined the French Company, Les Usines de Melle, manufacturers of chemicals and chemical plant, and 10 years later was appointed technical adviser to the board of De La Rue, Limited. He will continue to act as independent consultant to De La Rue and as a director of Ets. Wyns-Bristol, SA, a Belgian company.

DR. H. J. PHELPS

Mr. R. MENHENIOTT, a technical representative in the industrial branch of the Cardiff office of Holman Bros., has been transferred to North Wales to provide continued personal contact with customers in that area. Mr. Menheniott, who joined the company as an apprentice in 1936, will operate from 30, Plastirion Avenue, Prestatyn.

Mr. ALAN STOREY, surveyor at Horden Colliery (Co. Durham), has been appointed unit surveyor at Sandhole Colliery, near Manchester.

Mr. L. J. SMITH, North-east coast area sales representative for Darlington Forge, Limited, has been appointed sales manager. He will continue to act as North-east sales representative.

Mr. B. M. GARNER, deputy export sales manager of Perkins Engines, Limited, Peterborough, since 1950, has been appointed to the new post of deputy general planning and procurement manager of the Perkins group of diesel engine manufacturers.

Mr. J. D. WRIGHT has been appointed manager of the Templeborough melting shop of the Steel, Peech & Tozer branch of the United Steel Companies, Limited. He succeeds Mr. H. H. England, who has resigned.

Mr. JACK JARVIS has been appointed chief metallurgist at the Fullwood Foundry Company, Limited, Hamilton (Lanarkshire). He was previously technical assistant in the engineering metallurgical department of Newton, Chambers & Company, Limited, Sheffield.

Mr. GEORGE A. SMITH, who has been appointed general manager of the electronic and equipment group of the Plessey Company, Limited, has been with the company since 1957. He was appointed commercial executive of the electronic and equipment group last year.

The Nuralite Company, Limited, a member of the British Uralite, Limited, group, has appointed the following regional representatives:—Mr. E. CASEY (Western region); Mr. D. A. CONWAY (Southern region); Mr. P. W. CLABBURN and Mr. J. K. MILLER (Eastern region).

Mr. T. CARLILE, who has been appointed general manager of the Renfrew, Dalmuir, and Dumbarton works of Babcock & Wilcox, Limited, on the retirement of Mr. D. D. Cruickshank, joined the company in 1944. From 1950 to 1954 he represented Babcock & Wilcox in New York, returning to take up the appointment of assistant general manager of Renfrew and Dumbarton works. He was made deputy general manager two years ago.

Mr. F. CROOK, service manager of Ashok Leyland, Limited, Indian subsidiary of Leyland Motors, Limited, has been appointed head of Ashok's engineering division. Assisting him will be Mr. E. KAY, one of Leyland's senior design engineers. Mr. E. J. BROWNE, assistant service manager, has been appointed officiating service manager, and Mr. C. K. BHARATHAN, one of Ashok's field engineers, has been appointed officiating assistant service manager.

Mr. C. PENDRY, formerly of Drummond-Asquith, Limited, has been appointed sales manager of the newly formed Weldall-Grigg Machine Tools sales division of Charles S. W. Grigg, Limited, mechanical and hydraulic engineers, etc., of Hounslow (Middx). Mr. R. A. HAMMOND, of the parent company, has been appointed assistant sales manager. The central sales office will be at Stour Street, Birmingham, and the London office at 65-67, Hanworth Road, Hounslow (Middx).

Retirement From GEC After 48 Years

AFTER 48 years' service with the General Electric Company, Limited, Mr. A. B. Price, sales manager at the company's engineering works at Erith (Kent) has retired. Mr. Price received his technical training at Manchester University and then joined Fraser & Chalmers, Limited (later taken over by GEC), where he became assistant manager in the mining department. In 1922 he transferred to South Wales as Erith branch engineer.

In 1945 Mr. Price led a Government commission to the Ruhr coalfield to report on German practice on electric winding engines, and took an active part in the introduction of the Koepe system of winding to British coalfields. In 1946 he led a second commission to Germany to report on metalliferous mining equipment. He also published a book, "Winding Engine Calculations for the Mining Engineer."

After 27 years' service in South Wales, Mr. Price returned to Erith in 1949 to become manager of the turbine department, and a few years later became sales manager of Erith works.

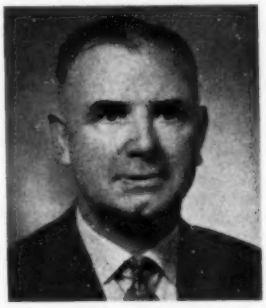
RICHARDSONS, WESTGARTH & COMPANY, LIMITED, marine, electrical and general engineers of Wallsend-on-Tyne—Current year's figures, states the chairman, Mr. O. J. Philipson, are "bound to show a substantial loss." All possible steps are being taken as part of a long-term programme to restore the profitability of the company. The British shipbuilding and marine engineering industries, the chairman adds, may well be facing a major and possibly prolonged recession and no positive indication of any early recovery can be seen at the present time.

PIT STRIKES CONDEMNED

20,000,000 Tons Lost Since Nationalization

CONDEMNING unofficial strikes in the coal industry, Mr. S. W. G. Ford, president of the National Union of Mineworkers, said in his opening address to the union's annual conference this week that in the last 12 months 2,250,000 tons of coal had been lost through unofficial action. He calculated that the cumulative loss since nationalization was about 20,000,000 tons. This record was "very disturbing," and the industry could not afford to carry the cost of such action, he said.

Mr. Ford went on: "Such stoppages create unnecessary hardships among union members, create uncertainty in the minds of many men in the industry, and . . . often give rise to doubts on the part of potential customers as to the ability of the industry to meet their requirements."



MR. S. W. G. FORD

Since nationalization, Mr. Ford said, the National Coal Board had had to import 26,500,000 tons. Had the 20,000,000 tons lost by unofficial strikes been available to the industry, the board could have avoided a very substantial part of the loss of £74,000,000 in imported coal. The immediate saving would have been about £50,000,000, but the extra proceeds which would have been obtained by the sale of this extra tonnage would have raised the figure to around the £78,000,000 which represented the NCB's total deficit to date. Also, the extra coal would have been available for customers who, because the industry could not meet their demand, particularly in the early 50's, turned to oil.

Need for More Efficiency

"There will be difficulties over the coming months," Mr. Ford said. "Let us show the world that we, within this nationalized industry, can resolve our differences in a civilized way and without recourse to war."

Earlier he had urged that it would be against the national interest to allow coal's share of inland fuel consumption to fall appreciably below the present level of 70 to 75 per cent., but emphasized that if they were going to maintain that level they would need to strive for greater efficiency.

Output per manshift had increased by more than 40 per cent. since 1946. In the first 24 weeks of this year, with 120,000 fewer men employed in the industry, they produced 3,500,000 tons more than in the corresponding period of 1946. Compared with last year, there were 32,000 fewer miners, but they were producing about the same tonnage. Encouraging as this progress was, they must never lose sight of the fact that if they were to realize all the aspirations and plans of the future, they must sell the coal.

Mr. Will Paynter, general secretary of the NUM, called for a radical recasting of the whole wage structure of the coal industry in the light of changes caused by modernization. He said the present structure, drawn up in 1954, was too rigid to accommodate either the major shifts in job content and relativities brought about by mechanization, or the changes in the real relative strengths of the three main categories of workers in the mines.

Coal-face workers paid on piece rates were forming a decreasing proportion of mine manpower, he pointed out. At present they accounted for 35 per cent., but within a few years they would be down to 15 per cent. as a result of the rapid spread of machine working on the coal face. Men on these new machines often switched to time rate methods of payment, and this could involve a drop in total earnings. Was the gap between the average earnings of pieceworkers and day wage men desirable? Mr. Paynter asked.

The spread of machines had in addition increased the importance and responsibilities of engineering and electrical craftsmen in the pits, and Mr. Paynter therefore demanded an "objective re-evaluation" of the wage relations between the three groups of workers—the ordinary day-wage men, the craftsmen, and the piece-rate workers.

The conference, on the basis of Mr. Paynter's analysis, passed a resolution authorizing a substantial new wage claim for 300,000 day-wage men as well as craftsmen and other specialist groups, but this is expected to lead to an early request to the NCB for a joint reappraisal of the Wages Structure Agreement.

The executive was instructed to pursue its old claim for a seven-hour day for underground workers and a 40-hour week for all surface workers, inclusive of meal times.

During a debate on the safety section of the Executive's report, Mr. Paynter rebuked the areas because none of them had sent in a motion on this subject. Mr. D. D. Evans, the South Wales general secretary, accepted the point and said that while unofficial strikes might have lost 20,000,000 tons of coal since nationalization, accidents had lost that amount last year alone.

Mr. F. Collindridge, Yorkshire secretary, was elected national vice-president in succession to Mr. E. Jones, who retired earlier this year. He received 417,000 votes. His opponent, Mr. Alex Moffat, vice-president of the Scottish miners, polled 199,000.

Personal

After 52 years with the company, Mr. ROBERT H. FUTTER, chief cashier with Hawthorn, Leslie & Company (Shipbuilders), Limited, Hebburn-on-Tyne, retired at the end of June.

Director of Guest, Keen & Nettlefolds, Limited, and several other companies, Mr. WILLIAM A. NICOL has been appointed a member of the Birmingham local board of Barclays Bank, Limited.

For the last 10 years catering officer for the No. 1 (Worksop) Area of the North-Eastern Divisional Coal Board, Mr. E. J. MACCABE has been elected a Fellow of the Hotel and Catering Institute.

Production director of Geo. Salter & Company, Limited, spring and roller bearing manufacturers, etc., of West Bromwich, Mr. P. P. C. DRABBLE, is retiring to devote his whole time to writing.

Mr. T. B. COLMAN, works manager of the Grantham (Lincs) engineering firm of Ruston & Hornsby, Limited, has been elected a technical education representative on the Education Committee of Kesteven County Council.

Sir HAMISH MACLAREN, former director of electrical engineering at the Admiralty, has been appointed a consultant to Associated Electrical Industries, Limited. He will advise on all matters concerning electrical eqipment for ships.

Export sales manager of the appliances division of Parkinson Cowan, Limited, Mr. MICHAEL ROWLEDGE, is spending three weeks touring the Mediterranean and West Africa to promote the products of the whole Parkinson Cowan group.

Director and shipyard manager of Harland & Wolff, Limited, Mr. J. H. MCCUAIG has retired after 49 years with the company. He joined the drawing office staff of the company in Belfast in 1912, and was made a director in 1954 in which year he was made OBE.

Director and company secretary of W. Richard & Son, Limited, ironfounders and engineers, of Middlesbrough, Mr. WILLIAM R. PINKHAM, who started with the company as an office boy in 1911, has retired. He received presentations from his colleagues and from the Richards family.

Mr. R. M. BELLINGHAM has retired as foreman of the metal preparation and machine shops of Smith & Wellstood, Limited, catering equipment manufacturers, etc., of Bonnybridge, but will continue his service with the firm in another capacity. He has worked for the company for 51 years.

Vice-admiral J. HUGHES-HALLETT, Parliamentary Secretary to the Ministry of Transport, visited the Sunderland shipyards of Bartram & Sons, Limited, and Austin & Pickersgill, Limited, and Swan, Hunter & Wigham Richardson, Limited, at Wallsend, on Tuesday. He expressed particular interest in the Monopol automatic plate-cutting machinery installed at Bartram & Sons' yard.

Mr. ARCHIE PRESSLEY, manager of the machine tool section of the machinery department of Thos W. Ward, Limited, machinery distributors and merchants, of Sheffield, has retired after over 51 years' service with the company. At a special lunch to mark his retirement Mr. Harold Vernon, a director, presented an inscribed silver salver to Mr. Pressley on behalf of staff colleagues.

After 50 years in the mining industry, Mr. TOM HAYNES, No. 3 group engineer in the No. 3 Area of the East Midlands Divisional Coal Board since 1954, has retired. He served his apprenticeship with the Clay Cross Company, Limited, Chesterfield, later moving to the Sheepbridge Coal & Iron Company, Limited, for whom he was for 18 years an enginewright at Glapwell Colliery. After service in the Yorkshire coal mines and the Derbyshire clay mines, he became an enginewright at Thoresby Colliery in 1949.

Marketing officer (exports) of the marketing department, South-Western Divisional Coal Board, Mr. WELLESLEY EVANS has retired after 46 years' association with the coal and shipping industries at Cardiff Docks. Mr. Evans joined the British-Italian Shipping & Coal Company, Limited, in 1915, and in 1936 became export and shipping manager of the Ocean Coal Company, Limited.

Lecturer in the Department of Fuel Technology and Chemical Engineering at Sheffield University, Dr. IAN FELLS, is to give a sectional lecture at the 18th International Congress of Pure and Applied Science at Montreal in August on "Ionization Processes in Gases and their application to Energy Conversion Systems." The lecture will deal with some of the latest methods of producing electricity directly from flames.

Manager of the export sales department at the Whitton works of the General Electric Company, Limited, since 1930, Mr. J. F. PRINCE has retired. He joined GEC at Manchester in 1919, and in 1924 was made manager of the company's engineering department at Liverpool. He is succeeded by Mr. K. D. STARR, who has been chief enginer and director of the GEC subsidiary, British General Electric Company of Central Africa (Pvt), Limited, at Salisbury, Southern Rhodesia.

In the London Gazette last Friday it was announced that Mr. ALFRED ROBENS, on whom a life barony was conferred in the Birthday Honours, will be known by the name, style, and title of Baron Robens of Woldingham, of Woldingham in the County of Surrey. Speaking of his choice of title, Lord Robens said: "I chose Woldingham, a small village in Surrey because I live there and love the place. I was born at Manchester and for 16 years represented Blyth in the House of Commons, I could not have chosen a Manchester or Blyth title without hurting the feelings of some of my friends."

Sheffield Honours Scientists in Fuel and Metals Fields

DIRECTOR-GENERAL of the British Coal Utilization Research Association, Dr. D. T. A. Townend, FRS, was among scientists who received honorary degrees at a Sheffield University degree congregation last Saturday. Dr. Townend, who was awarded a Doctorate of Technical Science, held the Livesey Chair of Coal Gas and Fuel Industries at Leeds University for eight years, and is a former president of the Institute of Fuel.

Prof. N. F. Mott, FRS, Cavendish Professor of Experimental Physics at Cambridge, who for many years has studied the electronic structure of metals and alloys, and Sir Alexander Todd, Professor of Organic Chemistry at Cambridge, and a Nobel Prize winner, both became Doctors of Science, and Dr. Ulic Richardson Evans, FRS, scientific writer and consultant, who leads a noted school of corrosion at Cambridge and was the first man to demonstrate how steel could be stainless, became Doctor of Metallurgy.

The degrees were conferred by the Vice-Chancellor of the University, Dr. J. M. Whittaker.

ECSC Coal Outlook

MORE PRODUCTION CUTS, FALL IN DEMAND

LITTLE basic change is expected in the condition of the coal market in the European Coal and Steel Community during the third quarter of this year, according to a survey drawn up by the representatives of the six ECSC member countries in the coal committee of the Organization for European Economic Co-operation. Further reductions in production capacity are expected to be accompanied by a rather poorer level of trade than last year, and coal stocks are expected to fall by only a small amount.

Total supply in the third quarter is estimated at 60,900,000 metric tons, compared with 61,000,000 tons in the corresponding 1960 period. This will be made up of ECSC output of 55,900,000 (56,200,000) tons and imports of 5,000,000 (4,800,000) tons. The amount of coal "lost" by the introduction of no-work shifts will be much smaller over the period than the 1,100,000 tons last year.

Total consumption for the quarter is estimated at 61,300,000 (62,200,000) tons, made up of pit consumption of 7,000,000 (7,100,000) tons, other ECSC consumption of 53,500,000 (54,200,000) tons, and exports to non-ECSC countries of 800,000 (900,000) tons.

Steel Industry's Needs

Consumption of coke by the iron and steel industry will remain at last year's level, while household coal consumption and that of industry other than iron and steel production will fall. The coal consumption of power stations only will be above the 1960 period's level. Coal stocks will fall by about 400,000 tons over the quarter, against a decrease of 1,200,000 tons in the third 1960 quarter. By the end of May this year they were 28,800,000 tons.

The Belgian Government has assured the ECSC High Authority that coal production of Belgium's subsidized mines will not have passed the 3,800,000 ton mark over the first half of the current year. This means that over the whole year, it is unlikely that the figure of 7,800,000 tons set by the ECSC Ministerial Council as the maximum for 1961 production will be reached.

The High Authority has stated that it is undertaking studies into the competitive position of the Belgian coal-mining industry in 1964, by which year the pit closure programme is required to be completed.

Under a new coal industry reorganization plan passed by the Government, a Coal Industry Directorate is to be formed in Belgium to control mining in the country. Mining companies will be compelled to carry through production programmes drafted by the directorate, and to exploit certain coalfields if required by the State body. Marketing of the companies' production will also be controlled by the directorate.

RECORD IRON-ORE IMPORTS were unloaded at the Hartlepools during the month ended June 18. During the period, 113,554 tons of ore were imported, almost three times the amount for the same period last year.

Sir John Charrington's Tribute to Coal Board

REVIVAL in the demand for house coal came as a surprise to the Coal Board as well as to others and I should like to express appreciation of the remarkable recovery in the output of large coal which the board was able to achieve at short notice."

SIR JOHN CHARRINGTON

This tribute is paid by Sir John Charrington, chairman of Charrington, Gardner & Locket, Limited, coal, coke, and fuel oil distributors, of London, E.C.3, in his annual report. Sir John also pays tribute to "the valiant fight to retain as much industrial trade for coal as possible" which is being made by Lord Robens, chairman of the NCB. The board, he says, is determined to see that coal and coke share in the increased demand for central heating and the company supported the board wholehearted in its vigorous sales campaign.

Sir John is able to report a record trading profit of £695,177 for "what could have been a remarkable year," adversely affected as it was by mild weather in February and almost summer temperatures in March. Profit for the year, after taxation, is £363,323 (£216,841).

"One-in-a-Million" Accident Prompts New Safety Plans

TO prevent a recurrence of the one-chance-in-a-million accident which killed Mr. Joseph Bowden (59), a conveyor maintenance man, at Askern Main Colliery, near Doncaster (Yorks), new safety measures are being introduced at the colliery.

Mr. Bowden was hit on the back of the neck when an arched roof support, weighing several hundredweights, "blew out like a bomb," it was stated at the Askern inquest. His brother, Mr. James Bowden, and two other miners were injured in the accident. A verdict of Accidental Death was returned.

Orders Placed

Glacier Metal Bearing Plant for USSR

CONTRACT worth over £400,000 for a plant to make its new tin-aluminium bearing has been received by the Glacier Metal Company, Limited, Wembley (Middx), from the Russian Government. Following Soviet tests on the bearings, the material is to be standardized on two Soviet heavy truck engines and also on two private car engines.

The bearing material, known as reticular-tin aluminium, which was developed by Glacier Metal in association with the Tin Research Institute, is stated to combine a very high load-carrying capacity with moderate cost. It is planned to make these in Russia on plant designed and built by Glacier in England and to be shipped out within the next two years.

HEATING AND VENTILATING division of Sulzer Bros. (London), Limited, has been awarded a contract for the mechanical services at the new Stevenage (Herts) factory of Bowater Packaging, Limited.

ALL THE COMPRESSED air drilling equipment required by Sociéta Italiano Lavori to construct a rockfill gravity type dam at Lago Verde in Northern Italy, is to be supplied by Holman Bros. Limited, Camborne (Cornwall).

CABLING FOR the Bankside power station in London is to be supplied by Malcolm & Allan (London), Limited, a company in the Metal Industries, Limited, group. The contract from the Central Electricity Generating Board is worth over £100,000.

FURNACE ORDERS worth £405,000 have been received from Czechoslovakia by AEI-Birlec, Limited. The contract calls for the supply of continuous tray pusher furnaces, gas-carburizing furnaces and sealed quench furnaces. Also included in the order are Birlec nitrogen generators.

ORDER FOR a 3,500-ton horizontal hydraulic extrusion press for Nimonic alloys has been placed with Fielding & Platt, Limited, Gloucester, by Henry Wiggin & Company, Limited, Birmingham. Total value of the contract, which includes auxiliaries, is in the region of £250,000.

CONTRACTS VALUED at over £1,000,000 has been awarded to Henry Simon, Limited, for the building of a complete new flour mill at Pulupandan on the island of Negros in the Philippines. This is the third new mill to be built by Henry Simon in the Philippines in the last two years, and will be of concrete construction.

AS A DIRECT result of the company's export drive in Europe, Africa, and Asia, contracts to the value of nearly £250,000 have been received by Cochran & Company, Annan, Limited, during the past few weeks for the supply of various types of industrial and marine boilers. Many of the orders are for the firm's recently-launched packaged boilers.

AN ORDER FOR more than 2,200 ft. of ventilation tubing, for use in the Emperor Gold Mine, Fiji, has been won by Flexible Ducting, Limited, Glasgow. The order is for a special rot-resistant plastic-coated nylon tubing, specially devised by the company for use in the highly humid conditions found in many mines. The tubing will be of 16 in. and 12 in. diameter.

MANUFACTURERS OF steam turbines and engines, condensing plants, etc., of Birmingham, Bellis & Morcom, Limited, has been awarded the contract for a 12,750 kW. turbine and condensing plant, by the Ministry of Works, for the National Gas Turbine Establishment, Pyestock. The turbine will be a straight condensing set, arranged to drive an existing alternator previously driven by a gas turbine.

WORTH MORE THAN £5,000, an order for a special oxygen cutting machine for plate splitting has been received by Hancock & Company (Engineers), Limited, Croydon (Surrey), from the South African Iron & Steel Industrial Corporation, Limited, near Johannesburg. The company has received another order, valued at £2,500, from First Electrics Corporation, Limited, of South Africa, for a standard Hancoline oxygen profiling machine.

HEAVY PLANT and motor and control gear divisions of Associated Electrical Industries, Limited, have received orders valued at £1,000,000 for the supply of equipment for three new cotton spinning factories to be built in Indonesia. The orders cover the supply of diesel generating equipment, lighting, switchgear, transformers, power and lighting cabling, diesel-house cranes and gantries, fuel-oil storage tanks, and various diesel-engine auxiliaries.

Coalite & Chemical Expansion Plan

PLANS are well advanced by Coalite and Chemical Products, Limited, for a major modernization scheme which will increase the output of the Askern works by at least two thirds, says the chairman, Cmdr. Colin Buist, in his report to shareholders. The scheme is subject to planning permission approval, and it is hoped to start construction before the end of the year.

The chairman reports that sales in the current financial year to date are satisfactory and that the order-books look promising for Coalite and chemicals. "Coalite remains the pre-eminent solid smokeless fuel, and there is so far no evidence to suggest that this will change," he adds. The oil additive business is expected to expand, and it is hoped that the acquisition of Duramis Fuels, Limited, will result in increasing profits over the year. Other schemes for expansion are under consideration.

Modification of all batteries at the Bolsover and Askern works is programmed for completion in a little over two years' time, and the cost, says the chairman, will be substantial, but so will the benefit. Other efforts to improve efficiency in every direction will continue.

1,000-ft.-Fall Ore Conveyer

CABLE belt rope driven conveyor installation having a vertical fall of over 1,000 ft., which is claimed to be a world record for vertical fall, has been completed by Cable Belt, Limited, Inverness, for Birkett Creek Mine Operators in British Columbia. The conveyor will handle copper ore and will generate a total of 350 h.p.

Other records claimed by the company are the longest single stage belt conveyor in the world (2½ miles-Australia), and the highest vertical lift (1,500 ft.-Japan).

WALTER SOMERS, LIMITED, makers of heavy steel forgings etc., of Halesowen—Group net profit dropped to £84,796 (£112,299), after tax of £61,281 (£53,158), but the dividend is held at 3d. per 2s. share.

"The picture of oxygen processes . . . is unavoidably untidy. Some plants are in, some are going in, some will begin in 1961, some firms are still uncertain and are still carrying out large-scale trials. Nonetheless, the great change is well under way and it is satisfactory that there is complete agreement with industry on the standards that must be attained." This statement, relative to atmospheric pollution by plants operating oxygen steelmaking processes, appears in the 97th Annual Report on Alkali, etc. Works by the Chief Inspectors, 1960 (Stationery Office, 4s.).

Move Towards

CLEAN AIR IN THE STEEL INDUSTRY

High Aim for Oxygen Steelmaking

CO-OPERATION with industry continues, states the report. Discussions at national level with the British Iron and Steel Federation, the British Steel Founders' Association, and the Joint Iron Council had led to agreement on broad decisions on most of the problems. These are being applied to individual site conditions by inspectors and works managements. There are some problems, *e.g.*, the bottom-blown Bessemer converter, which still prove intractable, but by and large the major decisions have been taken.

"Industry and the Inspectorate are agreed on the broad lines of the measures to be taken to deal with the great task in front of us. The cost will be recorded in millions of pounds and of manhours; nonetheless, there are grounds for sober confidence that the next two years will see remarkable progress. A sound and satisfactory start has already been made."

Preparation of Iron Ore

The operations of iron-ore calcination, drying, and sintering were described in some detail in the last report. So far as can be seen, the practice of clamp calcination is decreasing, and there are those within the industry who believe that it will cease completely within the next three or four years.

Ore drying and sintering are steadily increasing. Broad agreement has recently been reached with industry on the emission problems of both processes. With ore dryers where the scale of operations is small the Inspectorate will be satisfied with high-duty cyclones, but where the throughput is considerable much more efficient arrestment plant, equal to electrical precipitation in performance, will be needed. Intermediate cases will be considered by the Inspectors and individual works managements, with final decisions influenced by site conditions, prospects of increased throughput in the future and the like.

Where, as is usually the case, ore drying is effected by blast-furnace gas and there is no problem of sulphur dioxide emission, chimney heights can be quite low, *e.g.*, 120 to 150 ft. As to sinter plants, careful study of the problem has shown that the maximum effort for dust arrestment is needed at the discharge end. Even with medium-sized units an arrestment efficiency equivalent to that of an electrical precipitator would seem to be needed. On the other hand, it may well suffice if the strand gases, where the dust burden is usually very much less, are treated by cyclones or even by passage through a large settling chamber before admission to air. Because of their sulphur dioxide content the strand gases must be discharged at an appreciable height, up to 350 ft. or more, the actual height being determined by the amount of sulphur dioxide likely to be emitted. Transfer points on conveying systems, screens for fines, etc., whether operating in connection with dryers or sinter plants, should be enclosed and draughted to dust-arrestment plant.

Dryers and sinter plants completed recently conform reasonably closely with these requirements, but certain of the units existing when the 1958 Order came into force leave much to be desired.

Reference was made in the last report to the possibility of there being emission of fluorine compounds with the strand gases. Preliminary inquiries have shown that the hazard is much less than had been feared especially where self-fluxing sinter is concerned. Analyses of the sinter mix of raw materials and of the finished sinter for fluorine

suggest that almost all the fluorine is retained in the final sinter, possibly in consequence of the lime content of the mix.

Blast furnaces call for no extended comment in the present report. The big units at integrated works where all the blast-furnace gas is normally usefully employed in the heating of coke ovens, dryers, sinter plants, boilers, soaking pits, etc., have operated in a satisfactory manner, and any gas which had to go to air in an emergency was cleaned before such discharge. Some of the non-integrated and usually much smaller furnaces still cause concern, but a period of grace has been given, and already there is progress to record in that some works have reduced their emissions appreciably, while others are in process of so doing. The incidence of slipping of furnaces with the involuntary emission of dirty gas from the furnace bleeders is less than it was, due to improved operating conditions and to more careful preparation of the burden. But there are such occurrences and the emission is unpleasant.

Oxygen Steelmaking Processes

Major developments, etc., of steelmaking now taking place are changing the face of the industry, and it will not be until this time next year that a proper assessment can be begun. Industry has accepted the general policy of the Inspectorate that gas-cleaning plant must be fitted in the waste gas systems of steelmaking vessels in which oxygen is used for refining. The British Iron and Steel Federation has accepted the view that, as a general rule, the cleaners used shall reduce the fume loading in the exit gases to 0.05 gn./cu. ft. at 60 deg. F. and 30 in. Hg; a severe requirement, and about the threshold of visibility. The many gas-cleaning plants now being installed or on order are being designed to meet this requirement. Those few recently installed already meet it. In some cases the requirement will be met by bag filtration, in others by electrical precipitation, and in others by high-efficiency washers.

The production units installed, being installed or proposed of continental type, include LD, Kaldo, and Rotor. Those of British type include Ajax, or conventional types of plant, open-hearth, or electric arc furnaces, lanced in varying degrees of intensity with oxygen. Different works will adopt the production method best suited to their special needs. Some works will take molten iron direct from the blast furnace and convert it to steel of the required quality in one operation. Others will carry out the operation in two stages, *i.e.*, a prerefining of the molten metal by lancing with oxygen followed by completion of refining to steel in one of the conventional types of plant. Where the raw material is not molten iron direct from the furnace, but cold metal or steel scrap, the route must be via the open-hearth or arc furnace.

So far, the big works have necessarily been the preoccupation, as they cover the bulk of the production. There are, however, other facets. The use of limited amounts of oxygen either to assist melting or to speed up refining is practised in certain open-hearth furnaces, in smaller works where there is no gas-cleaning plant. It was in most cases an existing practice when the works became registrable under the Act in 1958. In other instances the Inspectorate is allowing full-scale experiments for a restricted period. The practice cannot be allowed to go on indefinitely and some difficult decisions are ahead.

Another problem concerns the small furnaces used in the steelfounding industry. Some are very small, of but 2 or 3 tons capacity, yet they are often in well-populated areas and when being lanced with oxygen they make their presence noted. There appears to be no alternative but to apply the same standard of 0.05 gn./cu. ft.; indeed, the British Steel Founders' Association has been so informed. Some firms have already installed the necessary fume-arrestment plant or are in process of so doing. The fume-extracting plant is, of course, proportionately smaller. As already noted, the picture of oxygen processes at the time of writing is unavoidably untidy. Some plants are in, some are going in, some will be begun in 1961. some firms are still uncertain and are still carrying out large-scale trials. Nonetheless, the great change is well under way, and it is satisfactory that there is complete agreement with industry on the standards that must be attained. The report for 1960 should clarify the position considerably.

Other Steelmaking Processes

There are no major comments to be made on the classical open-hearth process, still responsible for much of the UK steel production. About one fifth of the furnaces are below 60 tons capacity, with the remainder ranging up to 350 tons or more. It seems certain to lose ground to other steelmaking techniques. One very large works has already declared its intention to replace all its open-hearth furnaces by electric arc furnaces. Other works will apply oxygen lancing on a major scale. Yet the classical open-hearth technique is likely to persist for some time, but on a progressively decreasing scale. It is not intended for the time being to depart from the short-term provisional policy of waste-gas dispersal by recourse to high chimneys, the precise height of which is determined by the amount of sulphur dioxide emitted and by local factors.

Arc furnaces vary from 1 to 80 tons in capacity, with larger units in prospect. Their number is likely to increase, and the probability is that most will sooner or later practice oxygen lancing. It has been agreed with industry that gases from arc furnaces at which oxygen is used need to be cleaned only during the period of oxygen lancing. During the remainder of the steelmaking cycle there is no objection, at the present stage, to the untreated gases going straight to a chimney. Oxygen is used normally for only a small proportion of furnace time. In a melting shop with a number of furnaces there might be two waste-gas mains into which each furnace is connected, one going through a gas-cleaning plant to the chimney and

the other direct to the chimney. During the periods of intense brown fume emission on lancing, each furnace would be coupled to the cleaning-plant circuit, and during the periods of low fume production the furnaces would be connected to the common main leading straight to the chimney. The alternative is for each furnace to have its individual extraction and gas-cleaning system. Much will depend on melting-shop layout, size and number of furnaces, nature of operations, and so on.

The intractable problem is that of the bottom-blown Bessemer converter and its smaller relative, the side-blown tropaena of the steelfounding industry. As to the Bessemer, although no solution is yet in sight for dealing with emissions during turn-up and turn-down, a German visit proved that the technical problems associated with bottom-blown converters in the upright position had been solved a any rate in principle. A difficulty is the application to already existing units, and a greater one the uncertain future of the Bessemer process in this country. Once again some difficult decisions lie ahead. Some tropaena operators feel that fume containment and cleaning will be such a problem that they have decided to change to production by electric arc furnaces. The tropaena problem will be one of the major issues to be discussed with the British Steel Founders' Association in 1961.

Emission of Fluorine

Investigations have been continued into the emission of fluorine compounds due to use of fluorspar in the open-hearth process of steelmaking, with parallel tests being made by industry. These have confirmed the earlier findings that the concentration of fluorine compounds in the waste gases rises to a peak soon after addition of fluorspar, following which it falls away. Some two years ago industry agreed to consider reducing the use of fluorspar to the minimum compatible with efficient operation, and to use substitute materials wherever practicable. There is good reason to believe that on both grounds use of fluorspar is decreasing.

It is relevant to point out that with application of oxygen a liquid slag should be formed at an earlier stage in the melt, and the more rapid attainment of working temperatures should diminish the need for fluorspar additions. As all steelmaking furnaces using oxygen will be fitted with gas-cleaning plant, this should have a beneficial effect, as there is strong evidence that much of the fluorine is in particulate form. The general position is thus reasonably reassuring, and it is not proposed to resume investigations until the steel industry settles down to its new techniques.

Ironfounding Industry

Considering now the ironfounding side of the industry, the melting of iron in rotary and air furnaces calls for no considerable comment; the problems are those of smoke and dust. Here again, the use of oxygen is developing and similar fume plant is being asked for. The major, serious, and difficult matter is that of emissions from hot-blast cupolas. The report for 1959 stated that the broad lines of a provisional "best practicable means" for dealing with the emission had been agreed. Briefly they provided for the arrestment of grit and dust by cyclones, and similar means, and the dispersal of fume by a tall chimney. It was accepted on both sides that these measures were provisional to cover an interim period of experience. The agreement removed the uncertainty which was causing delay in decisions to install hot-blast cupolas.

Operating experience with hot-blast cupolas fitted with the agreed means is still limited. In a few cases it is successful; in others the correct conditions have not yet been attained. During the year doubt was expressed to industry whether the agreed means would be adequate to deal with some of the large plants which were planned, it being intimated that arrestment rather than dispersal of fume might be necessary for these units. The task is one of great difficulty, and pleasure is expressed that the Joint Iron Council has cordially accepted the suggestion that a working party of the industry and the Inspectorate be appointed to study the problems.

Karachi Steel-mill Project

HOPE that the implementation of the Karachi steel-mill project will start in the coming financial year has been expressed by Pakistan's Finance Minister, Mr. M. Shoaib, who said that offers from five international groups had been received for participation in the project, three of which were receiving the "serious attention" of the Government.

Meanwhile, Mr. S. M. Yousuf, Industrial Secretary, said that plans for the establishment of two steel mills, one at Karachi with a capacity of 250,000 to 300,000 tons, and the other at Chittagong with a capacity of 100,000 tons, had reached an advanced stage. With the completion of these mills the development of heavy industries in both West and East Pakistan would get a further fillip, he said.

A steel mill built by private enterprise in Bazid Bostam in the Chittagong area is also expected to go into production shortly. It is being set up at a cost of Rs. 3,000,000 to manufacture 15,000 tons of steel annually.

Metallurgical News from Russia

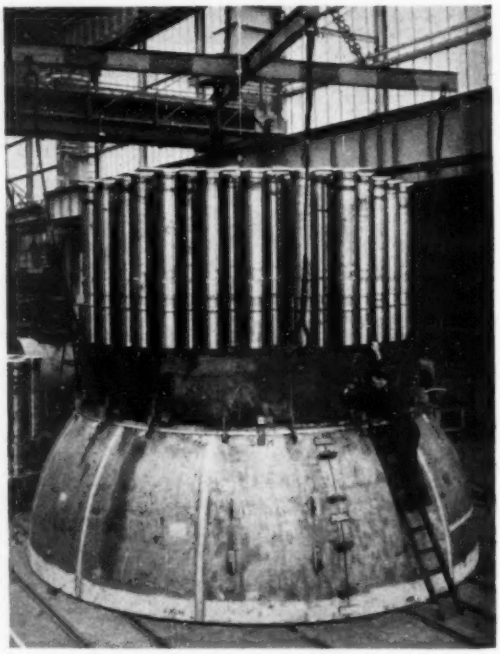
SEVERAL items of metallurgical news from the Soviet Union are reported by the BBC. A new open-hearth furnace has gone into operation at the Vyksa metallurgical works of Gorkiy Oblast. A big magnetite ore deposit of 40-45 per cent. Fe has been discovered to the north of Lake Balkhash in Central Kazakhstan. It is believed to be large enough to serve as a supplementary source of supply for the iron and steel works now under construction at Karaganda.

The BBC also reports that a big new iron-ore deposit, thought to amount to tens of millions of tons of 40 per cent. Fe ore, has been discovered in the Dashkesan area in Azerbaijan, and that two new iron-ore deposits—Layskoye and Cheremshanskoye—were recently discovered in the Nizhniy Tagil area.

H.E.R.O. Reactor Vessel

PHOTOGRAPH shows the top dome of the H.E.R.O. reactor vessel as assembled at the South Works of Ashmore, Benson, Pease & Company, Limited, Stockton-on-Tees, prior to despatch to the Windscale Works of the United Kingdom Atomic Energy Authority.

This vessel is probably the largest stainless steel vessel constructed in this country and is manufactured to extremely fine tolerances.



OXYGEN-REFINED FERRO-ALLOYS

WHAT may well be the beginning of the widespread use of oxygen in the ferro-alloys industry is its utilization by the Union Carbide Metals Company for refining ferro-chrome. According to an article by F. Weston Starratt in the Journal of Metals (March, 1961), the development of oxygen-refined ferro-chrome is the culmination of several years of experimental work at the Marietta, Ohio, plant.

Raw material for the process is an intermediate grade of ferro-chrome produced in a one-stage smelting operation in submerged-arc furnaces. Percentage analysis of this material is approximately:—Cr, 68 to 71; C, 5 to 6 Si, 2 to 3; S, 0.07. Oxygen refining reduces carbon from a maximum of 4.25 per cent. silicon to a maximum of 1 per cent., and sulphur to a maximum of 0.03 per cent., chromium being between 58 and 65 per cent.

In the new process, ferro-chrome, tapped from a submerged-arc furnace into ladles, is transported to the oxygen refining post where a hood is placed over the ladle. A vertical, water-cooled copper lance is lowered into position over the ladle containing from 8,000 to 10,000 lb. of ferro-alloy. Blowing commercially pure oxygen at the rate of less than 1,000 cu. ft./min. requires from 30 to 40 min. During the cycle, lime is added to form a slag. Considerable fume is formed and carried off through the hood into a dust-catcher. The overall cycle, including pouring the refined ferro-chrome into chills, is a matter of about 1 hr. The slag, because of its high chrome content, is returned to the submerged-arc smelting furnaces.

Refined ferro-chrome is a cheap source of chromium charge material for stainless steels, and is of particular interest to producers because its comparatively low carbon and silicon contents allow large additions of chromium to the base charge.

The author points out that it is less costly to reduce the carbon and silicon contents of ferro-chrome by oxygen blowing than it is to produce the same grade of material in a double-stage furnace operation.

Chain-link Normalizer

INTRODUCED by Associated Electrical Industries, Limited, is a new machine for the normalizing or full heat-treatment of steel chain links. Developed by the company in conjunction with the Parsons Chain Company, Limited, it will apply heat to an untreated link in a chain such as a joiner link, avoiding the costly reheating of the remainder of the chain. Although designed for links of from $\frac{1}{4}$ in. to $1\frac{1}{2}$ in. dia., it may be used occasionally to heat links of larger diameter. It is particularly useful in the assembly and repair of steel lifting chains to BS 1663, BS 2902, etc.

The complete equipment, including transformer and control gear is mounted in a fabricated steel structure designed to withstand rough handling. Facilities are provided for the addition of a salt bath when full heat-treatment is required for high-tensile alloy-steel chains.

The links are clamped pneumatically between electrodes conveying heating current from the transformer, which is provided with a range of tappings to give adjustment of current.

Electronic control can also be provided to give stepless variation of the current over an even wider range, and to enable the current to be altered during the heating of a link.

A photo-electric cell cuts off the heating current when a preset temperature is attained, thus preventing overheating of the chain.

EXPERIENCE WITH THE ARMSTRONG AIRBREAKER

A Review of Development and Results

The technique of blasting down coal by high-pressure compressed air has made an extensive contribution in the drive for large coal. In this paper, presented to the Midland Branch of the National Association of Colliery Managers on December 19, 1960, the author discusses the application of airbreaking. Operational results at Shirland Colliery, where an Armstrong Airbreaker was installed in August, 1958, are outlined, giving the effect of the installation on coal sizes and proceeds.

by F. B. TURTON, B.Sc.*

BREAKING down coal with air at high pressure was introduced into Great Britain five years ago at Bank Hall Colliery (Lancs). The principle was first conceived, however, in the US 25 years ago, and was developed because of restrictions on the use of conventional explosives underground while the main body of the men were at work.

The idea behind the method was basically a simple one, although the manufacture of equipment to develop and convey the high-pressure air naturally presented many difficulties. A compressor was sited at the surface, and this delivered air at a pressure of up to 12,000 lb./sq. in. through a shaft pipe range into the mine workings. The air was distributed with safety by means of narrow bore steel tubes, and these fed into copper tubes at the workings. A shell was connected to the copper line and, by inserting it into a large diameter shothole and liberating the air at a predetermined pressure, the coal was blown down ready for loading.

While the system was originally adopted because of its inherent safety features, it proved to be competitive with the cost of the existing alternatives. Some indication of the success achieved may be shown by the fact that in 1952, of all the deep-mined coal produced in the US, one fifth was broken down with the Airdox or Armstrong Airbreaker system.

A recommendation by the Anglo-American Council on Productivity led to the introduction in 1955, of the Armstrong Airbreaker at Bank Hall Colliery, where the equipment was applied to a longwall face which has previously used pneumatic picks and Cardox shells. A further installation was made at Coppice Colliery in the West Midlands Division of the National Coal Board, where experience was acquired with the Airbreaker in mechanized bord-and-pillar working. The conclusion drawn from these initial trials was that the system had much to commend it.

The first Airdox equipment to be installed in this country was at Hanley Deep Pit in 1957. The NCB's report for that year made special reference to the ability of the Airbreaker to produce a high percentage of large coal. The industry's need to market such products led to the installation of 40 sets of equipment during 1959, so that by the end of that year a total of 84 Airbreakers was in use at British collieries.

The author believes that the Airbreaker system has been firmly established in Great Britain. In this paper it is proposed to discuss some of the features of the system which will be of interest to the colliery manager, and to make particular reference to the cost of using an Airbreaker and the possible improvement that may be obtained in the coal sizes produced.

Selection of the Compressor Site

The compressor unit is an expensive item of equipment and, when put to use, performs a function that is vital to the coal-winning operations. Careful thought, therefore, must be given to the selection of its site so that it may be properly maintained and supervised in order to provide a reliable service.

In the US where the Airbreaker has been applied to room-and-pillar mining, the workings can be

* Manager, No. 4 Area, Silverhill Colliery, East Midlands Divisional Coal Board.

served by a fully mobile compressor unit. Such portable units have been designed to be either rail-mounted or self-tramming. In addition to the compressor itself, the chassis may also carry a large air receiver, the shells, and an operator's cabin having the shooting valves mounted within it. From the cabin the operator can safely carry out the blasting operations using armoured rubber tubing to couple the shells to the shooting valves.

There are two principle advantages to this method. Firstly, there is no expenditure on steel-line tubing. Secondly, the system provides a high degree of flexibility, which is important where the working places advance rapidly.

In Britain, where longwall faces advance relatively slowly, there would seem to be no justification for adopting the use of mobile compressor units, and a compressor is best sited in a permanent house conveniently situated to serve a number of faces. Good ventilation through the compressor house is essential. A quantity of about 10,000 cu. ft./min. is advisable and the air should be as cool and as free from dust as possible. Sites, of course, are best chosen at places where the ground has settled.

At a mine in which the workings are shallow, the compressor can be sited at the surface near to the mine entrance. In this case ventilation creates no problem and the machine can receive more careful supervision. If, however, the faces are from 3,000 to 4,000 yd. from the compressor, the cost of the steel line may prove to be prohibitive. In such a case one alternative does present itself, although its application depends very much upon the local circumstances. This is to pipe the air into the workings through a borehole situated at a convenient point.

Usually it is preferred to construct the compressor house below ground at a place near to a main trunk airway. The site should be at least 500 yd. from the nearest face to be served since this length of tubing will contain little more than 2 cu. ft. of air under pressure.

When constructing the girder and concrete foundations for the compressor bed plate, provision should be made to accommodate an air receiver if it is proposed to install one. It is also advisable to construct accommodation for a work bench and a test site. It is then possible to test shells, shooting valves, and hoses, and to carry out maintenance. This also provides an opportunity for training the compressor attendant to carry out maintenance work as part of his duties.

The floor space required to receive the compressor and its switchgear should measure about 30 ft. in length and 9 ft. in width. A height of approximately 10 ft. is reasonable with provision made to accommodate lifting gear.

The Armstrong Airbreaker Compressor

The compressor unit, together with the motor and intercoolers, is mounted upon a base plate measuring 12 ft. 6 in. by 5 ft. It is a six-stage horizontally opposed machine, powered by a 90-h.p. motor that can be coupled to either a 550-V or a 3,300-V supply.

Since technical literature dealing with the construction of the equipment has already been made available, consideration will only be given here to certain features affecting the safe and efficient operation of the machine.

To ensure that air entering the cylinders is as clean as possible, it is first passed through a large, dry, felt pad filter. After each stage of compression the air is passed through an intercooler and a strainer while the second- and sixth-stage air circuits have large strainers and water-traps to remove excessive moisture.

The running of the compressor is controlled by an automatic device. A pressure switch is set to permit the machine to trip in and trip out over a predetermined range of pressures. As air is discharged from the system the pressure changes influence a Bourden tube, the movement of which is transmitted through linkages to a pair of micro-switches. These control the motor circuit and they can be adjusted to any desired position, depending upon the blasting pressures required.

To allow the machine to start up on no-load conditions, cylinders No. 2 to No. 6 are fitted with unloader valves which vent to atmosphere when the motor trips out. In addition, a mechanical delay allows the motor to reach full speed before the valves reseat and the cylinders come under compression.

To provide a positive form of protection, safety valves are placed on all stages of the machine except the first. On more recent compressors a safety assembly, using the principle of a fusible tube, is fitted on the high-pressure system. This fractures and exhausts the line should the pressure exceed 13,000 lb./sq. in.

The compressors initially installed in this country are fitted with "Sirrom" heat-detection equipment. Four heat-detector elements are situated at the hottest parts of the machine; one behind No. 5 and No. 6 cylinder heads, two in front of the intercooler, and one after the intercooler, where the maximum airflow and temperatures are found. The detectors are connected to a balanced Wheatstone bridge circuit and a difference of 10 deg. to 15 deg. F. at a detector would cause sufficient out-of-balance current to stop the machine.

It will be appreciated that the operation of the "Sirrom" equipment depends upon a variation from the ambient temperature at which the controls are set. For more recently developed compressors a fully instrumented temperature control system has been devised. This is composed of capillary detector heads in the outlet air of the sixth stage, in the cylinder head of the fifth, and in the wall of the crankcase. The motor can be cut out should an undue temperature rise take place at any point which is instrumented. In addition, a gauge shows the temperature of the working parts.

In so far as lubrication is concerned, the machines originally installed in Great Britain were fitted only with a lubricating pressure gauge, which

is mounted alongside the six air-pressure gauges. Recent developments provide for protection that is similar to that outlined above for over-heating.

Other safeguards which are worthy of mention include the use of a plastic insulator block to prevent stray currents being passed from the machine to the steel-line system, and a copper line between the compressor and the steel line to absorb the effects of vibration.

Capacity of the Airbreaker

When intending to apply the Airbreaker to a hand-filled longwall face, it has to be decided whether to blast on the preparation shift or on the coal-filling shift. There are several conflicting issues to consider. There is the desire to take maximum advantage of the capacity of the machine and the need to keep foremost in the mind such practical matters as roof control and manpower limitations at the face.

It is convenient to consider first the capacity of the compressor itself and to ascertain what can be expected from it. The air compressor will produce about 220 cu. in./min. and this is approximately the volume discharged when a shell is used in blasting. Thus, theoretically, the machine should provide for about 60 shells/hr. with continuous running. In practice, however, one can say that 10 per cent. of the capacity is lost during operations at the face and, therefore, that 54 shots/hr. is a more realistic figure.

If the management aims to maintain a steady rate of firing throughout a 6-hr. shift, then it can budget for about 324 shots, producing, say, 1,200 tons of coal. If the shots required need to be fired within a period of 4 hr. then only 216 shots may be discharged and less coal is broken down. It will be appreciated, therefore, that preparation-shift blasting makes better use of the available capacity of the equipment.

Unfortunately, however, capacity is not the only criterion. In many British seams it is not practicable to break down the coal as cutting proceeds and let the unsupported roof stand until the oncoming shift has arrived to clear the coal. As with other methods of coal breaking, it is advisable to have the cut coal well cleaned out before air blasting.

If this work is normally carried out by the fillers, then an increase in both the costs and the manpower required may result if an attempt is made to do the work on the cutting shift. It is suggested that at most hand-filled faces it will be usual to blast on the filling shift unless roof conditions are consistently good.

Although the total number of shots which may be fired over a shift is limited by the capacity of the compressor, it is possible to arrange for the system to withstand temporary overloads. This is done by the introduction of specially designed receivers comprising five cells, each with a capacity of 400 cu. in.

The reliability of the compressor unit is of overwhelming importance to the manager whose pit is dependent upon an Airbreaker for the daily tonnage. The question of a standby compressor has, therefore, to be considered. If the running time of the machine is about 75 per cent. of the effective shift time then there is a strong case for the installation of a standby. If such is the case, where a compressor is required on double-shift working, a second machine to share the load of the first becomes very advisable. For large outputs when two compressors are needed to meet the demand, it is advisable to have an additional unit in reserve. The use of standby compressors does not, however, distract from the need for an adequate scheme of maintenance.

Distribution of Compressed Air

The compressed air is distributed to the districts through a system of steel pipelines, having an outer diameter of 1 in. and a $\frac{1}{2}$-in. bore. These tubes are normally in 20-ft. lengths and are cold drawn from a special chromium-molybdenum steel alloy. During manufacture they are tested to a pressure of 20,000 lb./sq. in., but the ultimate bursting pressure is said to be in the order of 55,000 lb./sq. in.

The line must have no leakages, so it is advisable to delegate one person to be responsible for their installation. Joints are made using a steel boss and a copper washer. On tightening up with a pair of Stilsons, the copper washer extrudes to form a tight seal with a protrusion in the pipe end. Care must be taken to ensure that the copper washer does not topple over during tightening.

Bends and junctions can be negotiated by using any of a variety of elbows, crosses, and tee-pieces, together with short lengths of steel tube if needed. On no account should a tube be bent. Copper or cupro-nickel tube has been used to negotiate corners, but such tubing can result in a serious throttling of the air flow, since its internal bore is only $\frac{7}{8}$ in.

Occasions will arise when it will be necessary to isolate sections of the line in order to carry out extensions, maintenance, or alterations. To minimize the quantity of air which has to be discharged, a steel-line flange and valve are installed at approximately every 500 ft. The valve has a small bleed-valve through which one side of the line can be discharged. The flange allows the line to be broken and, if necessary, blanked off. The steel-line system is extended to the face end of the gate road at which point a blow-down valve is installed.

The blow-down valve differs from the steel-line valve in that it can connect a steel-line with armoured rubber tubing. Through this valve the supply of air to the face equipment is controlled. It is an added advantage also to install at this point a suitably protected air pressure gauge to enable the district officials to note the operating pressure.

There are three principal methods of supplying the air to the face. These are by copper or cupro-nickel tubing, double-wire armoured rubber tubing, or by a suitable steel-line installation.

There has been no enthusiasm shown in this country towards the use of copper tubing on longwall faces. The main reason for this is that, after

repeated coiling and flexing, the copper becomes work-hardened and, after a time, fracture and splitting can take place.

Rubber tubing has been widely used with a measure of success. It is supplied in lengths of 25 ft. to 60 ft. and has double-wire armouring. The external and internal diameters are $\frac{5}{8}$ in. and $\frac{3}{16}$ in., respectively. The hose has an internal rubber lining for protection against oil and water vapour and an outer rubber cover to minimize rusting and abrasion to the wire armouring.

In spite of the safeguards and the ability to withstand a pressure of up to 24,000 lb./sq. in., difficulty does arise as a result of bursts on the hoses. The serious nature of such bursts varies in degree; many are merely of a nuisance value, but are wasteful in both time and money. Others have been accompanied by a complete breakdown of the armouring which may be caused by either rust or physical damage. Replacing and re-joining damaged hoses is an expensive business and has led to the development of steel-line systems at the face.

Face Steel Lines

A face steel line is built up with standard 20-ft. lengths of steel tubing. At convenient points along the line, say, every 20 yd., a tee-piece is inserted to which is fixed a shooting valve. The shotfirer has one shell to which is coupled a length of rubber hose having a male coupling piece fixed to its other end. This connection fits into its counterpart on the shooting valve and facilitates rapid connection. The rubber tubing is about 40 yd. in length, thus enabling the coal to be fired at any point on the face (Fig. 1).

The system has the following advantages. Firstly, it ensures that the pressures applied to any rubber hose at the face never exceeds the pressure required for blasting, and even this pressure is only for the period during which blasting actually takes place. A second advantage is the saving in effort required to move rubber tubing up and down the face. Generally, a limit of 150 yd. can be placed upon the distance that rubber tubing can be moved along a face and this can be reduced in the case of very thin seams.

The connection between the main steel line at the gate end and the face steel line may be effected with either a rubber or a cupro-nickel tube. As the length of this connection is normally kept to a minimum, armoured rubber tubing is often used. To ensure its good condition it is changed periodically. It is not impossible to use a solid steel-line connection straight through to the face, but the method is rather inconvenient because it necessitates a selection of short lengths being available to accommodate the daily face advance.

In cases where the steel face line is used with a flexible armoured conveyor, it can be assembled in the normal way with steel boss and copper washer joints. It may then be attached to the rear of the conveyor and snaked over with it as the face advances. On orthodox longwall faces the line assembly must be designed to allow it to be dismantled into convenient sections and moved forward with each turnover. The number of pipe

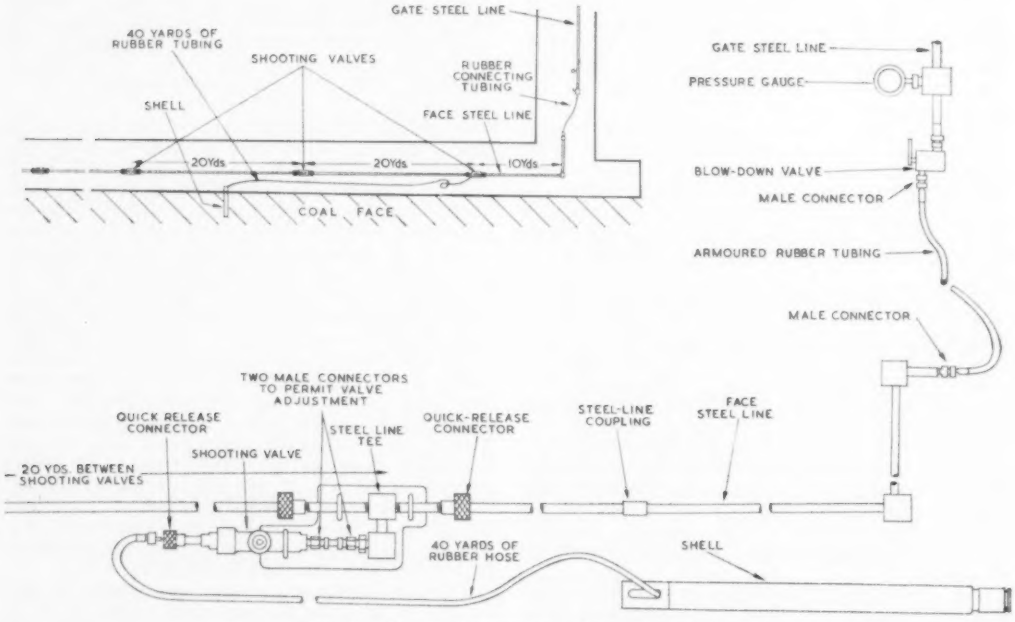


FIG. 1.—TYPICAL LAYOUT OF A FACE STEEL LINE.

lengths which can be moved over in one section will vary with seam height, but with a 4-ft. seam section a suitable length to handle would be 60 ft.

Quick-release Coupling

At the end of each section of line a suitable connection will be made to enable the steel line to be divided. To accomplish this a rubber or cupronickel tube may be used, but this will introduce the difficulties to which reference has been made. Another alternative is to use flange couplings with the connection secured by four bolts. While this provides a satisfactory joint, the time required for assembling and disconnecting it is greater than that required for the next alternative—the quick-release coupling.

The quick-release connector permits the line to be assembled without the use of spanners or other tools. Connectors may be placed either side of each tee-piece, which carries a shooting valve. It is then possible to break the line on either side of the valve and so move the valves and the sections of line over separately.

The quick-release connector consists of a male and female coupling, which are secured by a threaded housing. Provided care is exercised to maintain the threads in good order the connector will provide an effective and convenient seal. To form a rigid unit, it is advisable to fasten the shooting valve and tee-joint on to a steel plate. The connection between them should be capable of adjustment to allow for the removal and replacement of shooting-valves.

Details of the Shooting Valve

The shooting valve itself controls the flow of air to the shell by means of two poppet valves. It is so constructed that it is impossible for the shell and hose to be under pressure while the shooting valve is in the closed position. This safety feature is obtained by ensuring that the poppet on the shell side is open to atmosphere when the poppet on the line side is closed. The valve is operated by turning a shooting key through 180 deg. To prevent an operator from withdrawing his key while it is in the "on" position, a small weld can be put on the valve to ensure that the key will not withdraw unless it is in the "off" position. It is also advisable to have a shroud fitted over the exhaust port in the shooting valve. By having five or six small holes in the shroud it is possible to diffuse the exhausting air and direct it away from the operator and dusty surfaces.

A new design of shooting valve is being developed for use with face steel-line installations. It will be possible to screw this valve directly into the line and thereby make it unnecessary for collieries to prefabricate their own shooting-valve plates.

Shells provided are of two distinct types; namely, the nail and the shear-plate type. Both are essentially steel tubes which act as receivers to build up the air to a required pressure and volume.

The nail-type discharge head is used with 2½-in. dia. shells only, and has a series of backward haded discharge ports designed so that the resultant force always tends to drive the shell back into the hole. The ports are normally sealed by a piston carrying a short stem which passes through a sealed hole to the outer part of the head.

A common nail is used to retain the piston stem in position until the internal pressure has been built up sufficiently to shear the nail against an annular shearing edge. The movement of the piston uncovers the ports to discharge the high-pressure air. Since the operation of the nail-type shell depends upon moving parts, lubrication is very important. At the commencement of each shift the piston, "O" rings and threads should be lubricated with a thin smear of high-solids content molybdenum disulphide grease.

The shear-plate type of shell is supplied in 2-in. and 2½-in. dia. sizes and this type is now also being introduced for 2½-in. dia. shells. These have a similar series of discharge ports to those described above. Square steel plates are used to retain the air until the point of shear has been reached, but trials are going ahead at the present time to produce a plastic shear plate. A collector head at the end of the shell allows the ruptured plates to be collected by the operator at intervals. This type of shell has the advantage of no moving parts and consequently it is cheaper to purchase and has no lubrication problems.

Drilling Problems

In applying the Airbreaker to coal seams, the problem of drilling larger diameter shotholes has not proved as great as at first anticipated. It is generally found that by replacing explosives the number of shotholes required can be reduced by 30 per cent.

One of the greatest difficulties is to maintain the holes sufficiently free from breaks to permit the shell to pass right to the back of the hole. It is obviously best if the drilling can be carried out after the cutting has been completed, but this is often difficult to establish. If the breaks are not too troublesome the problem may be overcome by firing the holes several times until the back socket is reached. The occurrence of breaks may be reduced by paying greater attention to supporting of the cut coal.

In some cases it will be found that incipient breaks are extended by the blasting of adjacent holes and this has led to the double-shell or "leap-frogging" technique. Two shells are placed in adjacent holes and to each shell has been fitted a short length of rubber hose. The first shell is coupled to the air supply with a snap-coupling and is fired. This shell is then disconnected and moved to the third hole. The second shell is coupled up and fired and then moved to the fourth hole. This system may, of course, be applied using three or more shells if desired.

Another alternative to overcome the displacement of drill holes is to use a larger diameter drill-bit than would normally be required for the shell in use. While this may permit the shell to pass through small breaks, it will be appreciated that the efficiency of the blast will also be impaired.

Airbreaker Results at Shirland Colliery

Although the Airbreaker has many inherent safety features to recommend it, this system is also being applied in an endeavour to produce improved grades of coal for the market. It is therefore proposed to consider the results at Shirland Colliery (Derbyshire), where an Armstrong Airbreaker was installed during August, 1958. Before considering any results, however, a brief reference will be made to the method of working at the mine.

Shirland Colliery is a drift mine situated on the western outcrop of the North Derbyshire coalfield and is one of the 18 collieries in No. 4 Area of the East Midlands Division. The annual output is approximately 270,000 tons with an o.m.s. of about 44 cwt.

At the time of the installation of the Airbreaker, two seams were being worked, the Deep Hard and the Deep Soft. The seam sections varied between 3 ft. 6 in. and 3 ft. 11 in. From the outcrop the seams dip at about 1 in 8, and they were extracted from beneath a cover varying from 200 yd. to as little as 25 yd.

The workings were naturally wet, depending upon seasonal rainfall. Furthermore, the reserves of the Deep Hard and Deep Soft were limited and, in consequence, faces seldom had a life of more than 12 months or a length exceeding 130 yd.

All coal faces were worked by orthodox longwall methods; in the Deep Soft, coal was undercut with flat jibs and in the Deep Hard with double-turret mushroom jibs. After cleaning out on the day shift, the coal was broken down with a conventional type of permitted explosive and then hand-filled on to face chain conveyors. From the face the coal was taken by 10 or more trunk conveyors to the surface surge-bunker, thence through screens and washery to the wagon.

In September, 1959, workings in the Threequarter Seam, with a section of 2 ft. 4 in., were started, and, for a period of six months, contributed about 20 per cent. of the total colliery output.

The Armstrong Airbreaker was applied to both Deep Hard and Deep Soft Seams. While air blasting and cutting the double turret jibs became standard practice in the Deep Hard Seam where rubber hoses are used on the faces, the equipment had to be withdrawn from the Deep Soft during the latter part of 1959 as a result of repeated bursts on the rubber hose system. After some difficulty in obtaining the necessary equipment, a steel faceline was satisfactorily installed in the Deep Soft during May, 1960.

Effect on Coal Sizes

Sizing tests have been carried out at several collieries to determine the effect of air blasting and the results have been previously published. To quote figures where the Airbreaker has been compared with explosives, improvements in the make of plus 2-in. sizes have been given as 6.0, 6.5, 7.8, 10.0, 16.3, and 22.0 per cent.

At Shirland, a series of tests were made in the Deep Soft Seam during May, 1960, when samples were taken from the gate belt for two full consecutive shifts while the face was fired with explosives. Two further sets of samples were similarly taken during the days following when air blasting was in progress. For all practical purposes the conditions at the face were unchanged apart from the method of blasting. The mean values are shown in Table 1.

TABLE 1.—*Sizing Test in the Deep Soft Seam at Shirland Colliery to Compare Conventional Shotfiring with the Airbreaker.*

Size range.	Conventional shotfiring, per cent. weight.	Armstrong airbreaker, per cent. weight.	Per cent. increase (+) or decrease (−)
+ 5-in.	34.9	40.4	+ 5.5
2½-in. to 5-in.	9.3	12.2	+ 2.9
1-in. to 2½-in.	16.9	15.7	− 1.2
Below 1-in.	38.9	31.7	− 7.2

It will be seen that there was an increase of 8.4 per cent. in the +2½-in. sizes, while the improvement in the +5-in. sizes was particularly notable.

With these results in mind it is now proposed to consider the actual results obtained at the colliery before and after the Airbreaker was put into operation. In Table 2 will be seen the sizes produced during the 12 months preceding the Armstrong Airbreaker's installation, together with the results obtained during the period after it had been installed and established.

TABLE 2.—*Actual Saleable Grades Produced Before and After the Installation of the Armstrong Airbreaker at Shirland Colliery in August, 1958.*

Period.	Colliery output, saleable tons.	Blasted by Airbreaker, per cent.	Coal sizing.			
			+5-in	2½-in. to 5-in.	1-in. to 2½-in.	1-in.
1957, second half	141,228	—	10.9	10.7	19.2	59.2
1958, first half	131,374	—	12.6	10.6	18.9	57.8
1959, first half	136,064	45	15.8	10.3	18.2	55.7
1959, second half	136,225	49	15.6	10.9	17.3	56.2
1960, second quarter ..	61,390	46	15.3	10.5	17.4	56.8

During the period for which the figures are shown, there were, of course, other factors which, from week to week, influenced the make of large and small coal; for example, the extent to which different seams were worked, the incidence of faults and rock intrusions, the rate of development work in coal, and improvements at coal transfer points.

Since the re-washing of ground stocks with run-of-mine coal affected the results during the first quarter of 1960, these have been rejected as misleading. If Table 2 is examined with particular regard to the +2½-in. sizes, the following observations can be made:—Before airbreaking the large coal (+2½-in.) output was 22.3 per cent. of the total; with 45 per cent. Airbreaker firing the percentage was 26.1, showing an increase of 3.8 per

TABLE 3.—*Comparison of Proceeds for Total Colliery Output Before and After Installation of Airbreaker.*

Quality.	Price per ton. £ s. d.	July, 1957, to June, 1958 (inclusive).		July, 1958, to June, 1959 (inclusive).		July, 1959, to June, 1960 (inclusive).	
		Tonnage.	Proceeds (£).	Tonnage.	Proceeds (£).	Tonnage.	Proceeds (£).
Derbys + 5 in.	5 7 6	22,993	123,587	34,162	183,621	29,293	157,450
Hards + 5 in.	4 19 1	8,929	44,236	7,504	37,176	9,633	47,723
Washed cobbles, 5 in. to 2½ in.	5 7 3	28,966	155,330	27,397	146,916	27,333	146,573
Washed nuts, 2½ in. to 1 in.	4 5 11	51,935	223,104	48,958	210,316	46,663	200,456
Washed singles, 1 in. to ½ in.	4 6 4	8,178	35,302	6,682	28,844	7,676	33,135
Washed smalls, ½ in. to 0 in.	3 16 4	5,225	19,942	3,969	15,148	6,146	23,457
Untreated smalls, below 1 in.	3 9 4	146,376	507,437	139,722	488,369	138,910	481,555
Total	—	272,602	1,108,938	268,394	1,106,390	265,654	1,090,349
Average price per ton ..	.. ..	£4 1s. 4d.		£4 2s. 5d.		£4 2s. 1d.	

cent. With 46 per cent. Airbreaker firing the percentage was 25.8, showing an increase of 3.5 per cent., and with 49 per cent. Airbreaker firing, 26.5 per cent., showing an increase of 4.2 per cent.

This trend would seem to indicate that where all the coal is air-blasted, the +2½-in. sizes show an improvement in the order of 7 to 8 per cent. at the wagon.

Effect upon Proceeds

A comparison of the proceeds for the 12 months prior to the Airbreaker installation, with the two years following, is given in Table 3.

It is felt that the best way to effect a fair comparison is to take the make by quality for each 12-month period and apply the same price per ton for each year. In this way reductions in prices made during the summer months do not affect the assessment. The table shows an average price of 81s. 4d. for the period July, 1957, to June, 1958. From July, 1958, to June, 1959, during which period 30 per cent. of the coal was air-blasted, the proceeds increased by 1s. 1d./ton. The proceeds for the 12 months from July, 1959, to June, 1960, were affected by the lifting of ground stocks of 2,000 tons of Derbys and washed cobbles, but nevertheless the price was 9d./ton higher than for the period before the Airbreaker was introduced. From these figures it would appear that one could anticipate an improvement of between 2s. and 2s. 6d./ton where 100 per cent. Airbreaker coal is produced.

In fact, a comparison of the *actual* proceeds at the colliery shows an average increase of 9.5d./ton over the whole of the two years after the Airbreaker had been installed and during which time 38 per cent. of the coal was blasted by air. This increased the colliery's revenue by more than £21,000 and, even if it were argued that part of the improved revenue was the result of other factors, such an increase in income goes far to justify financially the introduction of the equipment.

The Cost of Air Blasting

The cost of installing and operating an Armstrong Airbreaker may be considered under four headings:—(1) The capital outlay; (2) the initial revenue expenditure to establish the steel lines and face equipment; (3) the maintenance of the compressor unit and the face equipment, including both materials and labour; and (4) the operating costs.

At the time that the equipment at Shirland Colliery was purchased in 1958, the capital outlay was:—£7,200 for the compressor unit, £820 for a 90-h.p. motor, and £600 for a transformer, receiver, and part of the freight charges, making a total of £8,620. Depreciation is taken over eight years and amounts therefore to an annual charge of £1,075. Interest at 5 per cent. amounts to a further charge of £430 per annum.

A large part of the equipment in the original consignment was on a revenue charge and amounted to a total cost of £6,440. This charge had to be made immediately on the colliery cost-sheet, but to allow the Airbreaker to be costed more realistically it is proposed to consider the cost spread over a period. The largest single item of the equipment was 2,000 yd. of steel line valued at £2,150. Other items included armoured hose, shells, shooting valves, and spares and replacements.

It is suggested that a fair assessment of this expenditure would be effected by making an annual charge of £3,220, thereby spreading the cost over a two-year period.

Maintenance and Operating Costs

A number of items which are included in the initial revenue were used to maintain the compressor during its first two years of duty. The only additional cost was £62 to purchase a set of pressure gauges, a sixth-stage plunger, and a few minor spares. The steel-line system required no replacements, therefore the annual charge for materials amounted to £31.

Mobile oil D.T.E. 105 used in the compressor lubricating system, was changed after approximately 350 hours' running time. The annual consumption of lubricant was 80 gal. and cost £25 per annum. An average of one shift per week was spent by a fitter on maintenance; for electrical maintenance it was found that half a shift was usual. An assessment of the labour cost would therefore be in the region of £200 per annum.

An expenditure of £274 was incurred over two years in maintaining and overhauling shells and shooting valves. The shells used were of the piston type, which require more servicing than those of the shear-disc type.

The cost of maintaining a face rubber-hose system is high. This can be shown by the fact that 5,000 ft. of hose was used in two years and

that this cost 1.7d. for each ton of Airbreaker coal. By comparison, the maintenance cost of a face-steel line is small providing regular attention is paid to the coupling pieces. Labour charges for time spent on the maintenance of rubber and steel lines and the repairing and servicing of shells and shooting valves amounted to approximately £300 per annum.

Airbreaking at Shirland Colliery was carried out on the coal-filling shift and, since most of the blasting needed to be completed within four to five hours, no reduction was made in the number of shotfirers previously employed.

Payments, however, had to be made for a certain amount of additional work that the system involved. In cases where the rubber-hose method was applied, an additional man was employed, whose duties were firstly to assist the shotfirers handle the hoses and shells and, secondly, to assist the fillers bore the larger diameter shotholes for the next day's shift. The boring of shotholes was included in the fillers' contract. The labour cost was about £15 per week.

Where the steel-line system was installed on the face a payment was made to each filler to cover the effort of drilling the larger shotholes and to the preparation shift men for the task of dismantling, turning over, and re-erecting the steel line. The weekly labour charge for one installation amounted to £20. It was deemed advisable to maintain and attendant continually to supervise the compressor during the filling shift. This man's wages amounted to £12 a week.

Pilot and reamer bits were used to drill the $2\frac{1}{8}$-in. holes. These cost £2 7s. each, compared with 16s. 6d. for the previous type used. Over a two-year period it was found that, on average, a boring bit drilled approximately 1,000 ft. and cost 0.6d./ton. By comparison, the cost of purchasing orthodox $1\frac{1}{16}$-in. bits amounted to 0.3d./ton.

Airbreaker Costs Compared with Explosives

A detailed account of the costs incurred in air blasting an annual output of 130,000 saleable tons is given in Table 4. As a basis of these costs the points previously considered have been used, together with the assumption that the output has been obtained at the rate of 520 tons/day from two faces which are equipped with steel-line systems.

It will be seen that the total costs amount to 2s. 2.2d. per ton, but before accepting this figure there are certain factors which should be pointed out. The initial revenue charge, which is spread over two years, amounts to 6d./ton and therefore constitutes almost 23 per cent. of the given total cost. Once written off, the Airbreaker cost should be reduced by something in the order of 5d./ton.

No provision has been made for the reclamation of steel-line tubing from discontinued working. It will be appreciated that after a time many collieries become self-supporting and that the cost will reduce by a further 1.8d/ton.

Summarizing, therefore, the cost of air blasting, a daily tonnage of 520 ton will be initially 2s. 2d./ton, reducing to the value of about 1s. 8d./ton after a period of two years.

A comparative figure for the cost of firing with

TABLE 4.—*Comparison of Costs for the Airbreaker and for Explosives for an Annual Output of 130,000 Tons.*

Airbreaker costs.	Weekly cost.	Annual cost.	Cost per ton.
	£ s. d.	£	s. d.
Capital:			
Depreciation	—	1,075	0 2.0
Interest	—	430	0 0.8
Initial revenue	—	3,220	0 6.0
MAINTENANCE:			
Compressor:			
Materials	—	31	0 0.1
Labour	—	200	0 0.4
Lubricant	—	25	0 0.0
Face equipment:			
Spares	—	137	0 0.3
Labour	—	300	0 0.5
Operating costs:			
Shotfirers—four	68 6 0		
Boring at 2d./ton	21 13 4		
Additional face labour includ. extra boring	40 0 0		
Pilot and reamer bits	6 10 0		
Steel line gate extension	20 0 0		
Compressor attendant	12 0 0		
Power for compressor	4 0 0	8,623	1 3.9
	172 9 4		
Explosives:			
20 lb. at 1s. 9d./lb.	1 15 0		
Detonators, 40 at 5d. each	0 16 8		
Powder carrying, 4 at 1s.	0 4 0		
	2 15 8	139	0 0.2
Total cost		14,180	2 2.2

Conventional explosives costs.	Weekly cost.	Annual cost.	Cost per ton.
	£ s. d.	£	s. d.
Operating costs:			
Shotfirers—four	68 6 0		
Boring at 2d./ton	21 13 4		
Drill bits	3 5 0		
	93 4 4	4,661	0 8.6
Explosive:			
Explosives 316 lb. at 1s. 9d. lb.	27 13 0		
Detonators 650 at 5d. each	13 10 10		
Powder carrying 70 at 1s.	3 10 0		
	44 13 10	2,235	0 4.1
Maintenance:			
Replace cables, rammers	1 10 0		
Labour on batteries	2 0 0		
	3 10 0	175	0 0.3
Total cost		7,071	1 1.0

conventional explosives is also given in Table 4. The quantity of explosive used is based upon 7.8 oz. per shot and 4 tons of coal being produced for each shot fired. After provision for routine maintenance and replacements, the total cost amounts to 1s. 1d./ton.

For true assessment of the overall financial results the improvement in the colliery proceeds must be taken into account. Earlier consideration would indicate that this would amount to approximately 2s./ton.

The profitability would therefore be as shown in Table 5.

TABLE 5.—*Comparative Profitability with Conventional Explosives and the Airbreaker System.*

	First two years.	Third year onwards.
	s. d.	s. d.
Airbreaker, cost/ton	2 2.2	1 8.0
Explosives, cost/ton	1 1.0	1 1.0
Increase in cost/ton	1 1.2	0 7.0
Increase in revenue/ton	2 0.0	2 0.0
Increase in cost/ton	1 1.2	0 7.0
Net gain/ton	0 10.8	1 5.0

A net gain of 10.8d./ton increases the colliery's revenue by £5,800 per annum, while 1s. 5d. increases it by £9,200. Even so, at 520 tons per day the Airbreaker equipment is operating at about half its capacity and, with further extension, the profitability should be more than that shown.

Summary

Mining engineers need no reminders of the hazards associated with the use and handling of explosives. While air blasting is not a too-proof system, it does possess certain inherent features which help to lighten the burden of responsibility which rests upon colliery management. The use of the Airbreaker eliminates the risks of misfires, the fouling of the ventilation at the face, and the use of detonators. The risk of igniting inflammable gas is reduced as is also the danger of ricochets. Breaks in shotholes do not promote the hazard that exists where explosives are used and neither is there any necessity for stemming.

On the other hand, in making use of air pressure at 12,000 lb./sq. in. a reasonably high level of care and maintenance must be exercised to ensure that all parts of the equipment are in a satisfactory condition. The equipment is simple to use and has been found to be applicable to most seams in this country. Rippings and wastes have been broken down by air blasting, but this application may be limited where the stratum is hard and difficult to drill.

Provided an advantage is gained through higher proceeds, the Airbreaker is an economical proposition where at least 500 tons of coal per day is obtained by its use. On account of the high initial cost, however, it is advisable to produce 1,000 ton/day to place it on a sound financial basis. As an alternative to explosives, both Cardox and Hydrox have found application in seams with a high rate of gas emission. The day-to-day problem of maintaining adequate supplies of Cardox shells at the face and of returning these to a recharging station is relieved by an Airbreaker installation. While Hydrox has the advantage of being easily re-charged on the district, the absence of fumes from the Airbreaker causes the latter to be more acceptable at the present time.

Acknowledgments

The author expresses his appreciation to Mr. F. D. Severn, Area general manager, for his permission to present the paper and for his advice and comment. He also expresses thanks to the scientific and marketing department, No. 4 Area, for its assistance, to Olin Mathieson, Limited, and its engineers for making available certain technical data, and to the Area surveying department and members of the staff at Silverhill Colliery for preparing the text and tables.

The opinions expressed are those of the author and are not binding upon the National Coal Board or any of its officials.

REFERENCES

Anglo-American Council on Productivity, Coal, December, 1951 p. 46.

H. Stafford and R. E. Greenham, "Report on Coal Breaking in the USA," National Coal Board, July, 1955.

"Coal Breaking by Armstrong High-pressure Compressed-air Method at St. Charles Colliery, Petite-Roselle, France," NCB Bulletin July, 1953.

"Armstrong Airbreaker at Bank Hall Colliery," NCB Information Bulletin No. 56/177.

J. W. Evans and W. L. Pugh, "Application of Armstrong Airbreaker to Mechanized Bord-and-Pillar Workings," Trans. Institution of Mining Engineers, 1957-1958, vol. 117, p. 100.

Smee, A., "Experiences with the Armstrong Airbreaker at Bank Hall Colliery." Trans. Institution of Mining Engineers, 1957-1958, vol. 117, p. 170.

R. E. Greenham and G. Moore, "Trials with the Armstrong Airbreaker in the North-Eastern Division," Trans. Institution of Mining Engineers, 1958-1959, vol. 118, p. 191.

R. E. Greenham, "Coal Breaking with the Armstrong Airbreaker," NACM (Yorkshire Branch), January, 1959.

P. G. Weekes and A. Mervyn Watkins, "Breaking of Coal by High-Pressure Compressed Air at Marine Colliery, Mon.", IRON AND COAL, June 13, 1958, p. 1425.

"Experience in Compressed-air Blasting," NCB Information Bulletin, No. 60/215.

A. B. Wildgoose, "Compressed-air Blasting in British Coal Mines," Colliery Engineering, November, 1960, p. 480.

DISCUSSION

MR. T. R. JAMESON, branch president, opened the discussion by asking whether the author had any personal experience of blasting solid coal with the Airbreaker in stable holes, or of the blasting of rippings by this method.

The AUTHOR replied that since there were no power-loaded faces at Shirland Colliery there had been no opportunity for trials with the Airbreaker in solid coal at stable holes. Flanking shots at the fast ends of longwall faces had been practised satisfactorily, but it had to be stressed that caution and supervision must be exercised to ensure that such blasts were not overburdened. If an overburdend shot was fired, the shell would cannon from the hole with damaging results.

As the colliery produced coal on one shift only, it was not an economical proposition to run the compressor solely for ripping shots. In addition, the Deep Soft rippings were hard to drill, and to boreholes for the 2½-in. shells in use would give rise to several problems. Consequently, no experience was acquired at Shirland with the Airbreaker in rippings, although many rippings could be blasted by this method. Where

a colliery was on double-shift production and shells of a smaller diameter were available, it would be well worthwhile having trials. In a coal heading at Shirland, very satisfactory results were obtained after the seam had been undercut. The 12-ft. wide heading required only four shots.

MR. W. J. BELFITT asked what steps were possible for maintaining continuity of output should the Airbreaker compressor fail, particularly if explosives were not available.

The AUTHOR replied that during his two years' experience with the Airbreaker such a failure had never occurred, although, of course, the possibility had to be envisaged. The colliery's registered premises and stores had available sufficient explosives to cover such a situation and, in the event of it being required, arrangements could be made for getting explosives to the faces affected. The author did not advocate the use of the Airbreaker holes for firing explosives because of the stemming difficulty and the impaired efficiency of the blast. He was aware of one such instance where a failure had occurred and the faces had been re-bored and fired by explosive. There had been no loss of output.

When a colliery was depending upon the Airbreaker for a very large output the need for a standby compressor was advisable to obviate such a situation arising.

In reply to MR. D. HARPER, who asked if the cost of the surface explosives attendant had been included in the comparison figure provided, the AUTHOR said that the wages of the attendant had been omitted intentionally because his services had been retained following the introduction of the Airbreaker installation. Explosives were still being used in rippings and stone drivages. However, if it were felt that his wages should be considered then for the given output of 130,000 saleable tons the cost would amount to about 1d./ton.

If this adjustment was made, it was suggested that the final conclusions drawn from the financial considerations would not be substantially altered.

MR. D. HUNT sought information on whether coal cleavage was given due consideration in Airbreaker applications. The AUTHOR replied that, as with all other methods of coal breaking, due consideration should be given to determining the best face line upon which the coal should be worked. At Shirland it was found that good results were obtained with the face worked 20 deg. from "on end."

With a face worked at right angles to this point, the cleat almost coinciding with the face line, difficulty was experienced with slines of coal rolling over from the face. These impeded the Airbreaker operator's progress and delayed the blasting, and often necessitated the face convevor being stopped to permit charging and recovery of the shell.

MR. STRETTON requested further information about the armoured rubber tubing bursts that had been experienced in the Deep Soft Seam and had subsequently led to the Airbreaker's withdrawal. He also asked whether the existing Explosives Regulations permitted the use of the Airbreaker for blowing down wastes.

Replying, the AUTHOR said that, in spite of much thought and discussion, the reason why the Deep Soft should have experienced more trouble with bursts than the Deep Hard installations had never been satisfactorily resolved. Both seams had damp conditions and the methods of work were similar. It might have been that one team of workmen exercised greater care and attention with the equipment than another so that less physical wear and tear resulted, but this was not proved.

In answer to the second question, the AUTHOR stated that the Coal Mines (Explosives) Regulations, 1956, did not govern the use of the Airbreaker in coal mines. While initially the application of the Airbreaker had been controlled by divisional and NCB directives, it was now governed by the Coal Mines (Compressed-air Blasting Shells) Regulations, 1960, which came into force on August 1, 1960. As with Cardox and Hydrox, it was not prohibited to use Airbreaker shells for "cuckoo shots" in the wastes, providing the statutory examinations for inflammable gas had been carried out and the results were satisfactory.

MR. G. E. POULTER spoke of his experience in the use of nails of varying lengths and possibility of abuse. He felt there was a need for a measure of standardization. He asked why slugs were in short supply, as he thought that shortage encouraged abuse of the equipment.

The AUTHOR stated that in his experience satisfactory results had been obtained with s.w.g. 7, 8, and 9 round wire nails, although he agreed that some standardization of the nail length used might be advantageous. The possibility of abuse always presented itself and accentuated the necessity for having only properly trained and qualified underofficials in charge of blasting operations of any kind.

It was because of the initial shortage of slugs that Shirland had confined itself to the use of nail-type shells, but it was felt that sufficient quantities should now be available for existing installations. While the colliery manager might at times be frustrated by being unable to obtain the latest type of equipment from the manufacturers, it had to be borne in mind that when dealing with such high pressures, it was imperative that all equipment introduced should pass extensive field trials before being generally accepted.

Replying to MR. A. VARDY, who asked why the shotfirer should not be allowed to use his discretion in the size of slug or nail for the different duties or various shots, the AUTHOR said that after his initial training every shotfirer acquired experience in determining what charge of explosive was adequate for any particular shot he was called upon to fire. That applied equally to the use of the Airbreaker, and shotfirers should have a range of nails or slugs available to meet the varying type of shot he would need to blast.

MR. G. A. PERCIVAL asked three questions. He wished to know who fixed the pressure of 12,000 lb./sq. in. for the Airbreaker system, why it was necessary to have 10,000 cu. ft./min. of air flowing through the compressor site, and he asked for further information on the use of longer shells for ripping shots.

The AUTHOR replied that, to the best of his knowledge, the pressure of 12,000 lb./sq. in. was fixed as the result of practice and experience in the US. In Great Britain, a blasting pressure of about 8,000 lb./sq. in. appeared to be usual and, therefore, a machine developing up to 12,000 lb./sq. in. seemed applicable. By setting the compressor to trip in and out between the range of 9,500 to 11,500 lb./sq. in. it was possible to maintain several shotfirers at work without reducing the available air pressure below the greatest shearing pressure required by them.

The amount of work being performed by the compressor determined, of course, the amount of heat required to be dissipated by the ventilation current. If the effective area of the compressor house was taken to be 65 sq. ft., after allowing for the compressor and its switchgear, then a quantity of 10,000 cu. ft./min. was necessary to maintain an air velocity of at least 150 ft./min.

Referring to the use of longer shells in ripping, it had to be noted that the amount of work done during the discharge depended on the volume of air in the

shell as well as on the pressure applied. Where strong stratum had to be broken down, it might be found that a longer shell was necessary to supply the greater volume of air needed.

MR. C. BARNES thought that, from the times stated, the present permitted maximum number of shots fixed by the manager might be varied in the case of the Airbreaker and he asked if this was possible.

The AUTHOR replied that while Regulation 38 of the Explosives Regulations, 1956, required the maximum number of shots to be fired in any one hour and in any one shift to be fixed by the manager, the Compressed Air Blasting Shells Regulations, 1960, made no such stipulation.

Where the Airbreaker was used it was possible for a shotfirer to blast off a greater number of shots than with explosives. Although tests for firedamp must still be carried out, time was not spent examining for breaks and cleaning out shotholes.

MR. W. M. FLETCHER asked if the armouring of the flexible hoses was solely for mechanical strength and inquired about the possibility of an electro-static discharge from these hoses.

The AUTHOR replied that the armouring of the rubber tubing had a dual purpose. In the first place it provided a degree of mechanical strength, but it also acted as an earthing screen and so obviated the possibility of an electro-static discharge. The armouring was connected through the joints to the steel-line system and thereby to the roadway supports.

TWISTING CONVEYOR BELT IN THE US

A CONVEYOR belt that automatically twists itself, reversing top and bottom surfaces of the belt, has been installed in the nearly 10 miles of rubber belting already at work at the Muskingum river plant of the Ohio Power Company in the US. The "turnover" belt is one of 14 conveyors used in a system that has hauled more than 13,000,000 tons of coal since it went into service in 1953. One of the world's longest permanent rubber conveyor belt installations, the system transports 800 tons an hour over a 4½-mile undulating course from a strip mine to a coal storage area.

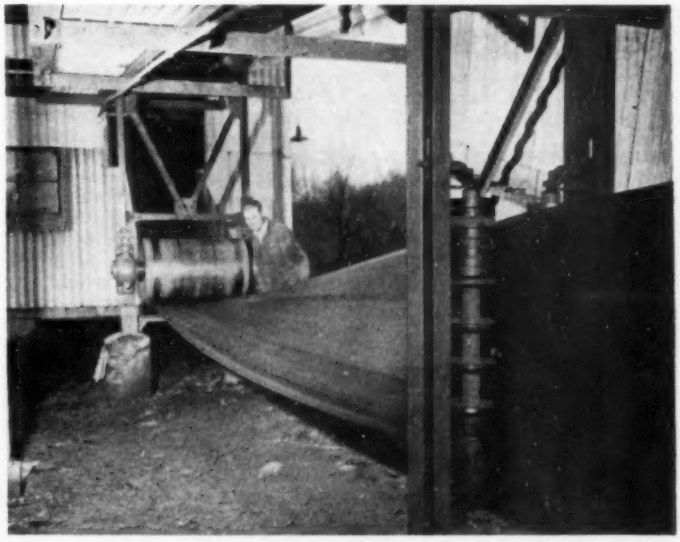
The turnover conveyor belt system, developed and patented by B. F. Goodrich Industrial Products Company, Akron, Ohio, prevents build-up of sticky materials on idlers or pulleys. Clogging of this type often damages both belts and idler equipment. The turnover feature was installed on one of the system's original belts with the twisting action accomplished by placing two twist pulleys at each end of the conveyor.

To keep its clean side on top of the return idlers, the 4,480-ft. belt delivers its load, then makes a 180-deg. twist to present a clean face to the idlers, returns to the loading point and makes another 180-deg. twist before accepting the new load. The belt's thick carrying cover is always positioned to receive the load.

The turnover system can be applied to any conventional conveyor system now in operation, without altering the conveyor framework. Necessary space for mounting turnover pulleys and accommodating the belt turn is all that is required. The system is recommended for use wherever a conveyor belt handles moist, wet, or sticky materials such as coal, iron, ore shale, or wet sand. Wet material can be handled at low temperatures with no danger of the belt freezing to pulleys and idlers.

Belts used on the Ohio Power Company Muskingum conveyor system range in length from 500 ft. to 2,964 ft. (pulley to pulley distance), are 36 in. wide, and travel 600 ft./min. Highest incline and decline traversed is 12 deg.

WORK HAS STARTED on an underground pipeline which will take natural gas 1,250 miles from the Bokhara desert at Gazli to the industrial cities of the Urals. With pipes over a yard in diameter, this will be the biggest gas main in the world, it is claimed.



THE "TURNOVER" BELT IN THE OHIO POWER COMPANY'S CONVEYOR SYSTEM, ONE OF THE WORLD'S LONGEST PERMANENT RUBBER CONVEYOR BELT INSTALLATIONS.

Valuation of Work in Progress

By a Legal Correspondent

TO the layman it may not be quite so obvious why, in determining the profits of a trade or business, the value of the stock in trade, and also of work in progress and not yet completed by the end of the account period, should be treated as much as part of the receipts as the price of stock sold or work completed, during the period in question.

From an accountancy point of view, this has been recognized as the proper position over a very long period of time, and, of course, for tax purposes the same rule holds. It may, however, be of some interest to note that there was a time when the value of work in progress was not taken into account at all in arriving at the taxable profits of a trade or business, and it was not until the decision in 1926 of the case of Whimster *v.* I.R. (12. Tax Cases, 813) that this practice came to be adopted.

As far as work in progress has to be valued, there are two schools of thought. According to the one, what is known as the "direct cost" method is to be applied; according to the other the "on cost" method is to be preferred.

The vexed question as to which method should be adopted in arriving at the taxable profits, has been the subject of an important judgment by the House of Lords in the recent case of Ostine *v.* Dup'e Motor Bodies, Limited (March 29, 1961). Everyone who conducts a trade or business should have some knowledge of the decision, particularly where profits are derived in any work from the manufacture of goods or the execution of work of any kind.

What do "on cost" and "direct cost," respectively, mean. It appears that accountants themselves have not a clear view of their meaning, or as to which method is to be preferred. Indeed, the House of Lords itself referred in the above case, to the difficulty of finding a definition, and, as Viscount Simonds remarked, it was still not possible after two days of discussion to form any clearer picture than that there was some difference between these two methods. However, the nearest perhaps that one can get to any sort of definition appears to be this:—

According to the *direct cost*, regard is had principally to the wages and material *directly* attributable to the work in progress, during the accountancy period, though it was conceded that some other items of expenditure as well may have to be included. On the other hand, the "on cost" method requires account to be taken in addition of overheads, which would have to be apportioned to the particular items of manufacture or work.

In the Duple Motor Bodies case, the company argued that the "direct cost" method should be applied for the purpose of the valuation; the Revenue, on the other hand, contended that the "on cost" method was to be preferred. It is of interest to observe that the "direct cost" method had been applied for many years in determining the value of the work and the taxable profit of the company and, as Lord Reid pointed out, a method that had been consistently followed in the past should not be changed unless very good reasons were shown. The House of Lords determined on the facts of the case that the "direct cost" method was the proper one to be adopted.

An examination of the judgments in this case throws further light on this important and difficult question. Preference was to be given to the "direct cost" method, since it was less vague and required, generally speaking, account to be taken only of wages and materials, in respect of which items of expense accurate figures could be obtained.

The "on cost" method required an apportionment to be made of overheads, and all sorts of difficulties arose in connection with this apportionment itself. As Lord Simonds remarked, it was the "widest guesswork", and the more accurate the estimate that was attempted, the greater likelihood of arriving at absurd results. Thus, if the trade in the particular period was poor, so that fewer articles were produced or less work put in hand, the proportion of the overheads which would be attributed to each item would be greater than would be the case if production was higher and trade better during the period in question. It wou'd follow therefore that if there was a slump an inflated value would be given to stock in trade or work in progress, because the number of the articles between which the overheads were to be spread would be reduced. Indeed, the application of two different methods to the figures in the present case produced an absurd divergence of results. According to "direct cost," the value of the work at the end of the accounting period would be £2,000 less than at the beginning, whereas according to the "on cost" method, so far from being £2,000 less, it would be £14,000 more!

Another reason for preferring the "direct cost" method was that if the cost was put at too low a figure in one period, the position wou'd right itself in the following period and *vice versa*, so that the error would automatically be adjusted from period to period.

If any practical conclusion is to be drawn from the case it would seem to be that the "direct cost" method of valuation is to be preferred, and that it will be extreme'y d'fficult for the Revenue to establish a preference for the "on cost" method.

FORTHCOMING EVENTS

JULY 17 and 18
Institution of Mining Engineers:—Junior section meeting in Nottingham.

JULY 19-21
Institution of Mining Engineers:—Summer meeting in Nottingham.

Hydrogen in Basic Open-Hearth Steelmaking

Influence of Gas and Tar Oil Firing Compared

(Continued from last week's issue, page 1399)

Study of the Hydrogen Content in Melts from the Open-hearth Furnaces at Works B

Characteristics of the Steelmaking Furnaces

The controlled melts were worked in basic open-hearth furnaces of 52 m. tons capacity, fired predominantly with producer gas. Coke-oven gas is used only occasionally in quantities not exceeding 14 per cent. by volume of the producer gas employed. The steelmaking furnaces producing the experimental melts were fired with about 1.5 m. tons oil for one melt, which was atomized with superheated steam in a quantity of 0.5 to 0.75 kg. per 1 kg. oil. A cold charge is loaded into the furnace and worked by the scrap method. In Table 9 are some parameters of the steelmaking furnaces in which the controlled melts were worked.

TABLE 9.—*Certain Parameters of the Steelmaking Furnaces at Works B, in which the Controlled Melts were Melted.*

No. of furnace.	Type of furnace.	Weight of charge, m. tons.	Hearth area, m^2.	Hearth loading, m. ton/m^2.
I ..	Open-hearth	52	29.8	1.74
II ..		52	31.4	1.66
II ..				

As opposed to the steelmaking furnaces at works A, the open-hearth furnaces at works B have a much less favourable ratio between the weight of the charge and the surface area of the molten bath.

Experimental and Comparison Melts

The experimental work was facilitated by the fact that it was possible to work the same furnaces with and without oil firing. The furnace charge averaged 33 to 49 per cent. open-hearth pig-iron, 45 to 63 per cent. normal scrap and 4 per cent. steel swarf: 2.8 to 3 m. tons lime was charged into the furnace as the slag-forming addition. After shaping up the slag with forging scale and ore for dephosphorization, and after melting down the charge, part of the slag (1,200 to 1,800 kg.) was tapped off, and an average of 1.2 m. tons lime was again added. By shaping up the new slag with bauxite and suitable additions of ore the pure boil was started. After attaining the lower limit of the prescribed carbon limits 400 kg. open-hearth pig-iron were added to the furnace, and tapping was carried out.

In toto, control was carried out on 24 melts of steel in accordance with CSN 11608, with alternate firing of the furnace with gas alone and with gas with the addition of oil atomized with steam. For production reasons the melts were controlled in three series, during which especially reliable results were obtained during the last series of 12 melts; in this instance on every occasion two melts were controlled in direct succession: one of the melts was worked with producer gas and the other with the addition of steam atomized oil.

The results of these experiments were verified by production experiments, which the steelworks carried out during the production of low-alloy, 33ChN3MA steels, finished off under a carburized slag. These melts were first of all worked in the normal manner, as already set out above. Towards the end of the pure boil the slag was gradually deactivated with a mixture of powdered lime and coke breeze. After the damping down of the boil SiMn and alloying elements were added. After about 40 to 60 min. the melt was tapped into the ladle. In this series seven melts were assessed, which were worked with the addition of oil and atomizing steam, and a total of 32 melts heated with gas alone.

Control of the Experimental and Comparison Melts

Specimens to determine hydrogen, oxygen, and nitrogen, and specimens of the slag were taken in the same sequence as at works A. During the working of all the melts the temperatures of the steel and the slag were measured with immersion thermocouples.

At this steelworks the delivery of producer and coke-oven gas is recorded on the melting sheets. On the basis of the data recorded, this makes possible more accurate assessment of the furnace atmosphere during the finishing of the melt. The delivery of oil and steam was unchanged during the course of a melt.

During the working of each melt a recording was made of meteorological data concerning the pressure of water vapour in the air and the overall

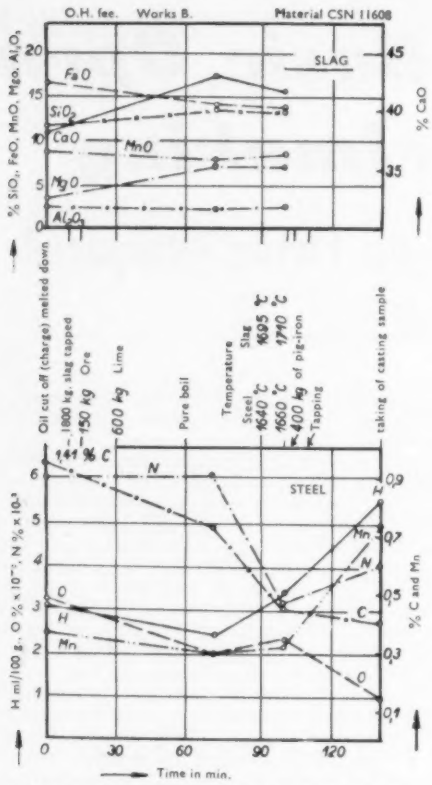


FIG. 11.—SEQUENCE OF HEAT NO. B19, MELTED WITH GASEOUS FUELS.

nature of the weather. In accordance with the information provided an assessment was made of the furnace atmosphere during the refining of the melt.

From the controlled low-alloy melts of steel, samples of the steel were taken only for the determination of hydrogen, as a rule before the addition of lime and bauxite and before carburization of the slag.

Results of the Experiments and their Analysis

(*a*) *Melts of Carbon Steel, Melted with the Addition of Steam Atomized Oil.*—A typical sequence of a melt worked in an open-hearth furnace at works B is shown in Fig. 11. For more lucid comparison, in Table 10 are shown the average results of all the controlled melts.

During the first and especially the second series of experimental melts, on production grounds individual melts were controlled within a longer space of time, within which a change could take place in the factors governing the hydrogen content in the liquid steel.

In the third experimental series individual experimental and comparison melts were cast one after the other without an interval. Therefore, such results of the third experimental series are the most reliable.

From the results it may be deduced that melts worked with the addition of oil and atomizing steam have a higher content of hydrogen than the comparative melts by about 0.5 ml H/100 g steel. The oxygen and nitrogen contents remain practically the same in both groups. The higher hydrogen content in the experimental melts is not manifested by a reduction in their quality, assessed by mechanical and technical tests under production conditions.

In the later part an assessment was made of the influence of the rate of decarburization on the hydrogen content of the steel before tapping. The decarburization rate for the melts from the open-hearth furnaces varied between 0.26 and 0.61 per cent. C/hr. during the period of the pure boil, and the hydrogen content fell within this period without exception for all the melts.

The hydrogen content of the steel before tapping from the furnace was only slightly influenced by the decarburization rate (Fig. 12); the correlation coefficient, $r = -0.20$. In the diagram are also drawn in melts which were controlled in the earlier research.[8, 13] No relationship of any importance was established between the temperature of the metal before tapping from the furnace and its

TABLE 10.—*Average Contents of Gases in the Experimental and Comparison Melts.*

Sample taken.	No. of furnace.	Experimental melts.			Comparison melts.		
		ml H/100 g.	O per cent.	N per cent.	ml H/100 g.	O per cent.	N per cent.
1st series:							
After meltdown	I	3.2	0.021	0.006	2.7	0.016	0.006
Start of pure boil		4.2	0.025	0.003	3.8	0.023	0.002
Before tapping		5.4	0.025	0.003	5.1	0.026	0.002
Casting sample		5.9	0.010	0.004	5.7	0.009	0.004
2nd series:							
After meltdown	II	2.1	0.012	0.007	2.5	0.015	0.004
Start of pure boil		4.1	0.023	0.006	2.8	0.015	0.005
Before tapping		4.2	0.025	0.004	4.4	0.022	0.003
Casting sample		5.3	0.009	0.005	6.0	0.012	0.004
3rd series:							
After meltdown	I	2.0	0.017	0.005	2.9	0.019	0.005
Start of pure boil		3.7	0.020	0.003	3.3	0.017	0.003
Before tapping		4.6	0.025	0.003	4.1	0.024	0.003
Casting sample		5.9	0.010	0.006	5.3	0.009	0.005

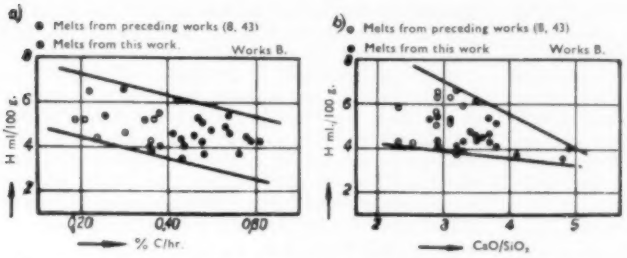


FIG. 12.—(*a*) EFFECT OF THE DECARBURIZATION RATE ON THE HYDROGEN CONTENT BEFORE TAPPING. (*b*) RELATIONSHIP BETWEEN THE HYDROGEN CONTENT OF THE STEEL AND THE SLAG BASICITIES EXPRESSED BY THE RATIO CaO/SiO_2.

hydrogen content. The temperature of the steel in the ladle was not measured.

An important influence on the hydrogen content of the metal is exerted, especially by the slag. During the production of steel in open-hearth furnaces the bath is initially protected by the slag to a lesser extent than in Talbot furnaces. During the working of the experimental and comparison melts 96 to 100 kg lime were charged per 1 m^2 of the surface of the bath. During working 1,200 to 1,800 kg slag are tapped off, and approximately 1,200 kg lime are charged, *i.e.*, 23 kg/m. ton apart from other additions; at an average content of 4 per cent. hydrate water 0.01 per cent. hydrogen passes into the bath during the course of working, which corresponds to 112 ml H/100 g. steel.

With the increasing basicity of the slag, expressed by the ratio CaO/SiO_2, the hydrogen content of the metal diminishes somewhat, as is evident from Fig. 12*b*. The correlation factor of the points in the diagram, $r = -0.31$. The diagram also shows the melts controlled in earlier works. No relationship at all was established between the hydrogen content and the MgO content in the slag, which was low and did not exceed 10 per cent.

In the literature there are presented contradictory opinions on the influence of temperature on the solubility of hydrogen or of water vapour in the slag. Yavoiskii, for instance, considers[9] that the solubility of hydrogen falls with an increase in the temperature of slags. Contrary to this, Bogatenkov[37] *et al* assumes that with a higher temperature there is a higher solubility of hydrogen in slags and thereby in liquid steel also. Within the framework of this research the temperature of the steel and of the slag has been measured with immersion thermocouples for the majority of the controlled melts.

During the assessment of the results it has been established that the temperature of the slag influences changes in the hydrogen content during the pure boil, as is evident from Fig. 13*a*. With the increase in the temperature of the slag it is possible to observe a greater growth in the hydrogen content of the steel, which is evidence of the greater rate of diffusion through hotter slags.

The correlation factor of the points in the diagram $r = -0.65$ shows a marked closeness of the relationship.

In conclusion, an assessment was made of the effect of the partial pressure of the water vapour in the furnace atmosphere on the hydrogen content of the steel. For the calculation of the atmosphere in the furnace use was made of the last data for the delivery of fuels on the melting sheet. During changes in the delivery of fuel, as a rule, the delivery or air and oxygen remains unchanged, which was taken into consideration during the calculation.

The partial H_2O pressure in the atmosphere of the open-hearth furnaces at works B varied within the limits of 0.040 to 0.085 atm. The average pH_2O in the atmosphere for the melts, worked with the addition of oil and atomizing steam and without such an addition, is given in Table 11.

TABLE 11.—*Average pH_2O in the Furnace Atmosphere During the Addition of Oil and Atomizing Steam and Without these Additions, by Comparison with the Average Hydrogen Content of the Steel Before Tapping.*

Sequence of melts.	Oil + steam, average pH_2O atm.	ml H/100 g steel.	Gas only, average pH_2O atm.	ml H/100 g steel.
1st series	0.075	5.4	0.072	5.1
2nd series	0.062	4.2	0.061	4.4
3rd series	0.064	4.6	0.050	4.1

The hydrogen content of the steel in the ladle shows a slight relationship with the pH_2O in the air (Fig. 13 *b*). The diagram is completed with data of melts taken from preceding works.[8, 13] The correlation factor of the points in the diagram, $r = -0.07$, indicates a very low degree of correlation.

In a ladle in which the steel is covered with slag, the rise in the hydrogen content is brought about primarily by its liberation from the cooling

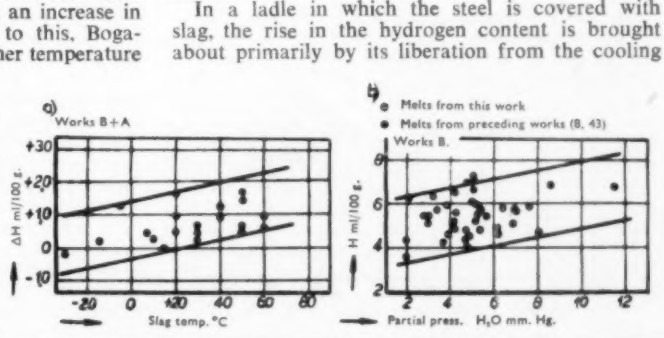


FIG. 13.—(*a*) RELATION BETWEEN SLAG TEMPERATURE AND HYDROGEN CONTENT DURING THE PURE BOIL. (*b*) HYDROGEN CONTENT IN THE LADLE IN RELATION TO PARTIAL PRESSURE OF HYDROGEN IN THE AIR.

slag into the steel, as has been shown in earlier works.[8, 13]

(*b*) *Melts of Low-alloy Steels Worked with the Addition of Tar Oil and Atomizing Steam.*—The average hydrogen content in the low-alloy, 33ChN3MA steel melts, worked with the addition of steam atomized oil, together with the average hydrogen content in 22 melts of steel of the same type, controlled during the course of a year, are given in Table 12.

TABLE 12.—*Average Hydrogen Contents During Production of Low-alloy Steels, Melted, on the One Hand, with Heating Gases Only, and, on the Other, with the Addition of Oil and Atomizing Steam.*

Sample taken.	Producer gas, ml H/100 g steel.	Addition of oil and steam to gas, ml H/100 g steel.
Start of pure boil	4.2	5.0
Before addition of coke ..	4.5	4.9
Before tapping	6.5	7.2
From ladle	6.9	7.2

Also during this comparison it was established that there is an increase in the hydrogen content of melts worked with the addition of oil and atomizing steam. The greatest increase was established before tapping the melt from the furnace. In the ladle the differences between the hydrogen contents were evened out.

Suggestions for shortening the period of holding a melt under a carburized slag, expressed in relation to the production of steel in tilting furnaces at works A, are valid to the same extent also for melts of alloy steels worked by the same method in the open-hearth furnaces at works B.

As opposed to the tilting furnaces, these furnaces have the advantage of a lesser depth of the bath, and therefore the possibility of more rapid melting down and homogenization of the concentration of the alloying additions. Apart from this the whole melt is tapped into a single ladle, which facilitates complete mixing of all the components.

ASSESSMENT OF THE RESULTS OF THE STUDY OF HYDROGEN AT WORKS A and B.

The hydrogen contents established at both steelworks have been plotted in relation to the partial pressure of the water vapour in the furnace atmosphere, as shown in Fig. 1, and this comparison is given in Fig. 14. According to the diagram presented, the hydrogen contents of the carbon and alloy steels from the Talbot and Wellman furnaces at works A are well below the equilibrium state with pH_2O in the furnace atmosphere. The highest hydrogen contents of the steel at works A were established before tapping the alloy steels, finished under a carburized slag, where the level of hydrogen reaches dangerous concentrations for the occurrence of flakes.

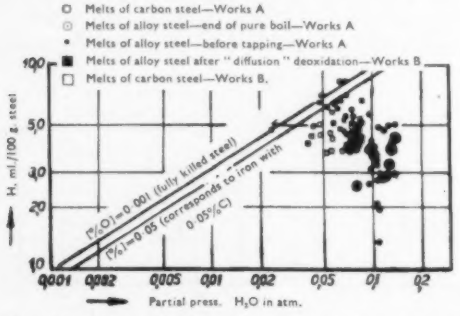


FIG. 14.—HYDROGEN CONTENT IN THE CONTROLLED HEATS FROM WORKS A AND B IN COMPARISON WITH THE EQUILIBRIUM CONTENTS OF HYDROGEN, OXYGEN, AND WATER VAPOUR.

In view of the fact that the hydrogen content of the steels produced at works A is well below the equilibrium with the atmosphere, for these melts no relationship at all was established between pH_2O in the atmosphere and the level of hydrogen in the steel. Under these conditions the hydrogen content of the steel is not influenced by the use of oil atomized with steam.

The hydrogen contents of the carbon steels from the open-hearth furnaces at works B approach more closely to the equilibrium state with the atmosphere. During the finishing of the alloy steels under a carburized slag in the open-hearth furnaces at works B the hydrogen content of the metal reaches equilibrium with pH_2O in the atmosphere, or exceeds it. Therefore, at works B a definite increase in the hydrogen content was established in melts worked with the addition of oil and atomizing steam. These conclusions may be justified by the fact that the contact surface between the bath and the atmosphere is more than 50 per cent. less in the large steelmaking furnaces at works A (3.8 to 4.8 m. tons/m^2.) than in the open-hearth furnaces of works B (1.7 m. tons/m^2.).

The rate of transition of the hydrogen from the atmosphere into the steel is determined by the rate of its diffusion through the layer of slag. In view of this, under the same conditions and during the same period of time only about half the quantity of hydrogen passes from the atmosphere through the slag into the steel in the furnaces at works A, by comparison with that passing in the furnaces at works B. In the furnaces of works A, therefore, the lower average intensity of the boiling of the steel in the period of the pure boil (0.20 per cent. C/hr.) in many instances brings about a reduction in the hydrogen content, whereas in the open-hearth furnaces of works B this will not as a rule be attained even by a high decarburization rate (averaging 0.47 per cent. C/hr.).

For the reasons presented, at works A steel is produced with a lower level of the hydrogen content than at works B, despite the fact that the atmosphere of the steelmaking furnaces at works A is richer in water vapour.

The important influence of the size of the contact surface between the atmosphere and the slag which has been established is an evident cause of the low effectiveness of boiling of the bath during the period of the pure boil on the final level of the hydrogen content of the melt.

With the increasing intensity of the boil there is indeed an increase in the liberation of hydrogen

from the bath, but simultaneously the turbulence increases the surface area of the slag and of the metal. so that the reverse passage of hydrogen from the atmosphere to the bath is accelerated.

In earlier work,[8, 13] the more important favourable influence of the intensity of the boil during the period of the ore boil was recorded in agreement with other research workers. In conformity with the results of these works it is possible to attribute the greater reduction of the hydrogen content during the ore boil above all to the cooler slag, which is continuously cooled by the frequent additions of ore or lime, thus slowing down the diffusion of hydrogen from the atmosphere into the steel.

From this point of view one can recommend that melts of any steel which has a tendency to flakes should be worked as follows: during the period of the ore boil the melt is brought to an intensive boil by means of plentiful additions of ore, and the duration of this boil should be as long as possible. The pure boil should last only about half an hour[30].

The thermal running of the melt is controlled in such a way that the maximum temperature is reached at the start of the pure boil; during the course of the pure boil, on the other hand, the melt is maintained at a constant or gradually falling temperature (Fig. 13*a*).

The use of oil for firing furnaces does not influence the sulphur content of the steel. The average S content in the melt samples of steel melted with oil at works A was 0.016 per cent. S, and in the same types of steel melted with gas, it was 0.019 per cent.

At works B the average S content in melts worked with the addition of oil was 0.020 per cent., and in the melts without the addition of oil 0.018 per cent.

Likewise, the average content of oxygen and nitrogen in the steel is not influenced by the use of oil for firing steelmaking furnaces. Although added steam for the atomization of the oil raises the oxidizing potential of the atmosphere and accelerates the running of the furnace, it does not have an important influence on the level of the oxygen content of the steel.

At both steelworks the hydrogen contents after the meltdown of the charge are strikingly low. At steelworks A the contents are attributable to the working with a hot-metal charge.

At steelworks B low hydrogen contents are attained through the rapid melting down of the charge and the slag.

In Table 3 is indicated the connection between the average rate of melting down of the charge and the hydrogen content of the melts, assessed from previous[8, 13] and present research.

Apart from the rate of melting down, the hydrogen content after melting down is also determined by the quality of the charge, as has been established already in earlier works.[8, 13] The final hydrogen content of the melt, however, is quite uninfluenced by low H contents after the meltdown (see Table 13).

SUMMARY OF THE MAIN FINDINGS

(1) The use of tar oil "A" for the firing of steelmaking furnaces does not increase pH_2O in the furnace atmosphere, and, consequently, also does not increase the hydrogen content of the steel, if the oil is atomized with air.

(2) pH_2O in the furnace atmosphere is in large measure determined by the use of steam for the atomization of oil. Atomization of oil with steam does not significantly affect the level of hydrogen in steel produced by the normal method in large furnaces with a hearth loading exceeding 3.8 m. tons/m^2.

In steelmaking furnaces with a hearth loading of less than 2 m. ton/m^2, however, replacement of gaseous fuels by means of fuel oil atomized with steam, brings about a rise in the level of the hydrogen content, especially during the production of steel finished off in the furnace under a carburized slag.

By increasing the excess air coefficient it is possible to fire furnaces with oil atomized with steam, without radically raising the level of pH_2O in the furnace atmosphere, and therefore also of the hydrogen in the steel. This measure is necessary in certain instances for increasing the life of the lining of the furnace and of the regenerators, but from the economic aspect it is not strictly advantageous.

By extrapolation of the mean hydrogen contents, plotted in a diagram in relation to pH_2O in the atmosphere, it is reasonable to expect that, at a moderate excess of air, expressed by the coefficient 1.2, the hydrogen content will rise before tapping from the furnace for carbon steels from the former average of 4.5 to 5.8 ml H/100 g; for steels finished under a carburized slag it will rise from the former level of 6.5 ml H/100 g to 8.0 ml H/100 g.

After tapping the melt from the furnace into the ladle naturally other factors will be valid, which as a rule tend towards equalization of the differences indicated. (At an excess of air expressed by the factor 1.2, the pH_2O in the furnace atmosphere was calculated from the value $pH_2O = 0.12$ atm., on the assumption that to 1 m. ton oil will be added 0.6 m. ton steam and 11,845 m^3 air with an average humidity; $pH_2O = 5$ mm. Hg.)

(3) An important factor determining the hydrogen content of steel is the extent of the contact surface

TABLE 13.—*Rate of Meltdown of Charge and Hydrogen Content after the Meltdown.*

Year of experiment.	Average weight of charge, m. tons.	Average meltdown time, hr.	Average meltdown time (min.) 1 m. ton.	Average H content after meltdown, ml/100 g. steel.	Average H content at end of ore boil, ml/100 g. steel.	Average H content in ladle, ml/100 g. steel.
1949–50	46	5.34	7.3	6.1	5.3	} 5.4
1949–50	49	4.52	6.0	3.3	4.8	
1958–59	51.7	4.27	5.2	2.7	3.6	5.5

of the molten bath with the atmosphere, the quantity of slag, and its physical and chemical properties.

(4) With an increasing MgO content in the slags during a killed boil of the bath, the hydrogen content of the steel is significantly decreased. Effective MgO contents of the slag vary around 20 per cent. MgO. A gradual fall in the hydrogen content can be established also with the rising basicity of the slag within the limits of the CaO/SiO_2 ratio expressed by the Figs. 3 to 7.

(5) With the increasing temperature of the slag the rise in the hydrogen content of the liquid steel is significantly increased.

(6) The normal moisture content of the slag-forming additions does not significantly influence the hydrogen content of the steel during the course of the oxidation period of melting.

(7) A reduction in the time of holding of steel melts after additions of alloying materials under a carburized slag is justified, and can shorten the melting time and improve the quality of the melt by restricting the high rate of increase in the content of gases, especially of hydrogen, in this period.

(8) On tapping the steel from the furnace into the ladle without a slag, capillary condensation of the water vapour on the surface of the refractory lining of the ladle in relation to the partial pressure of the water vapour in the air brings about an increase in the hydrogen content of the melt. By the use of hot ladles it is possible to restrict this influence.

(9) The use of oil "A" for firing steelmaking furnaces does not influence the content of oxygen, nitrogen, and sulphur in steels. Atomization of the oil with steam raises the oxidation potential of the atmosphere and accelerates the running of the furnace, without significantly affecting, in the quantity indicated, the oxygen content of the bath.

BRITISH IRON AND STEEL INDUSTRY

Translation Service

FOLLOWING is a list of some new translations available from the Iron and Steel Institute under its translation service scheme. Translations are all classified by numbers, and these should be quoted on applications, which should be addressed to the institute at 4, Grosvenor Gardens, London, S.W.1.

1845: "Resistance to Deformation of Carbon and Nickel Steels and Alloys." M. A. ZAIKOV. Izvest. VUZ Chernaya Met., 1958, Apr., 103-116. £5 15s.

1982: "Production and Uses of Plastics-coated Sheet and Strip." G. FRANK. Blech, 1960, 7, June, 299-309. £7 15s.

1997: "Further Development of Mechanical Weighing Equipment for Steelworks." H. FRICKE. Stahl Eisen, 1960, 80, Oct. 13, 1398-1403. £5.

2025: "Chemical-metallurgical Studies on Welds." K. BORN. Schweissen Schneiden, 1960, 12, Apr., 139-146. £6 5s.

2137: "Studies on Mild-steel Enamelling. I—On the Pre-treatment of Mild-steel Plate for One-coat Enamelling." T. YAMADA. J. Metal Finishing Society of Japan, 1960, 11, Feb., 10-14. £6 15s.

2162: "A New Apparatus for the Immediate Measurement of the Carbon Potential of Furnace Atmospheres." T. SCHMIDT and J. WÜNNING. Stahl Eisen, 1960, 80, Dec. 22, 1952-54. £2 5s.

2067: "The Problem of the Quality of Large Steel Forgings." P. BASTIEN. Rev. Mét., 1960, 57, Sept., 815-826. £6 5s.

2168: "The Extrapolation of Creep-rupture Data." A. KRISCH. International discussions on Long-time Behaviour of High-temperature Steels. (Düsseldorf, 1960), Paper 9. £4.

2169: "Comparison of Various Methods of Extrapolating Rupture Data." K. BUNGARDT and W. SCHMIDT. *Ibid.* Paper 10. £4 5s.

2172: "Developments in the Production of Blade Forgings for Steam and Gas Turbines." B. N. BATAGOV, *et al.* Kuznechno-Shtampov (Moscow), 1960 (1), 18-20. £2 5s.

2107: "The Production of Steel by the LD Process." R. G. WALZEL. ATB Métallurgie, 1960, 2 (1), 13-20. £8 10s.

2108: "The Forging of Heavy Billets Between Plane Tools." LYU KHAI-KAUN', *et al.* Kuznechno-Shtampov (Moscow), 1960, 2 (9), 1-5. £4.

2111: "Research on the Drawing of Small Thin-walled Tubes of Stainless Steel." T. OKAMOTO and K. TAKAHASHI. Tetsu to Hagane, 1960, 46 (3), 311-313. £4 15s.

2130: "Testing Sinter Strength." A. SEND and B. WEILANDT. Stahl Eisen, 1961, 81, Mar, 2, 303-311. £6 15s.

2170: "Development of a Special Steel for Concrete Reinforcement (Ribbed Torsion Steel—"Rippen-Torstahl"). W. JANICHE and H. WASCHEIDT. Beton- u. Stahlbetonbau, 1961 (1), 6-10. £4.

2191: "Recent Research Work on the Boron-carbon System." G. V. SAMSONOV. Zhur. Fiz. Khim. (Moscow), 1958, 32, Oct., 2424-9. £3.

2214: "Increasing the Sensitivity of the Industrial Dilatometer with Mechanical Recording Device." E. N. KISLYAKOVA. Zavods Lab., 1955, 21 (2), 240-241. £1 10s.

2251: "The Pickling of Sheets and the Avoidance of Pickling Defects." G. HOECK. Blech, 1958 (11). £3 5s.

1623: "The Statistical Analysis of Breakdowns in Electrical Installations to Improve Reliability." (With discussion). K.-H. LOPITZSCH. Stahl Eisen, 1959, 79, Sept. 3, 1273-1280. £5.

1696: "The International Development of Instruments

and Controls for the Iron and Steel Industry." H. KRÜGER. Neue Hütte, 1957, 2, Feb.-Mar., 103-111. £5 10s.

1895: "Towards International Standardization of Reports on Blast-furnace Trials." C. G. THIBAUT. Rev. Mét., 1960, 57, May, 379-386. £2 15s.

1974: "Scientific Management Staff Work in the Service of Top Administration.—III. Production Planning, Order Analysis, and Control with Punch Cards." F. W. WEICHSELMANN. Stahl Eisen, 1960, 80, Nov. 24, 1787-1798. £6 10s.

2043: "Preparation Technique in Electron Microscopy." K. MÜHLETHALER. Schweizer Archiv., 1960, Apr., 157-162. £3 5s.

2067: "The problem of the Quality of Large Steel Forgings." P. BASTIEN. Rev. Mét., 1960, 57, Sept., 815-826. £6 5s.

2068: "New Possibilities of Reducing Voltage Fluctuation in Steelwork Grids." K. HAAMANN. Stahl Eisen, 1960, 80, Nov. 24, 1776-1779. £3.

2082: "The Application of Digital Measuring Techniques to Metallurgical Engineering and Research." H. KNÜPPEL and W. DÖRR. Stahl Eisen, 1961, 81, Jan. 19, 73-88. £10.

2133: "The Application of X-ray Fluorescent Spectroanalysis in the Iron and Steel Industry." H.-J. KOPINECK and P. SCHMITT. Arch. Eisenhüt., 1961, 32, Jan., 19-29. £7.

2150: "S.G. Iron for Mining Machine Components." L. P. GORUSHKINA, *et al.* Lit. Proizv., 1960 (5), 42-43. £1.

2179: "Behaviour of the Free Gas Jet in Air." J. MAATSCH. Techn. Mitt. Krupp (Essen), 1961, Mar., 17-31. £7 5s.

2196: "Dilemmas in the Present-day Development Trends of Cogging Mills and Ways of Resolving Them." P. A. ALEKSANDROV. "Obrabotka Metallov Davleniem" ("The Working of Metals by Pressure"). Collection of articles No. 2, edited by N. P. Gromov, Moscow, Metallurgizdat, 1953, 76-92. £6 10s.

2213: "The Inert Gas Tungsten Arc Welding of Thin Sheet Steel for Transformers and Dynamos." J. RUGE and W. RAUCHFUSS. Schweissen Schneiden, 1958, Feb., 55-58. £4.

2216: "Petrographic Investigation of Converter Slags Formed During the Top-blowing of Metal with Oxygen." L. I. KARYAKIN and E. V. IVANOV. Ogneupory (Moscow), 1959, 24 (10), 455-462. £4.

2217: "Wall Blocks of Electric Arc Furnaces from Magnesite-chrome Brick Waste." M. N. KAIBICHEVA, *et al.* Ogneupory (Moscow), 1960, 25 (4), 186-188. £1.

2218: "Sulphur Method of Determining Oxygen (Oxides) in Metals." A. K. BABKO, *et al.* Zavods. Lab., 1956, 22 (6), 640-645. £4.

2219: "Determination of the Rate of Hydrogen Diffusion in Metals." R. A. RYABOV and P. V. GELD. Zavods. Lab., 1958 (3), 306-308. £3.

2220: "Electrolytic Production of Coils." G. ECKELMANN. Commercial publicity material from G. Eckelmann KG. £1 15s.

2222: "Sheetplate Containers for Aggressive Contents." G. FRANK. Unknown. £2.

2254: "Experiences with Direct Reading Spectrographs in the Iron and Steel Works Laboratory," 10th Report. H. HILDEBRAND and W. DIEHL. Arch Eisenhüt., 1959, 30, Nov., 659-660. £2.

2257: "Comparative Examination of Iron Oxide Aerosols and a Simple Method of Producing Them." A. SCHUTZ. Staub, 1959, Aug. 1, 291-296. £4.

Atmospheric Pollution

FEWER complaints of atmospheric industrial pollution occurred in 1960 according to the 97th Annual Report of Alkali, &c., Works by the Chief Inspectors, 1960 (HMSO, price 4s.). During the year specific complaints concerning 292 works were investigated in England and Wales, mainly at the request of local authorities. This compared with 354 complaints in 1959 and 133 in 1957. Complaints were most numerous against ceramic works (47), gas and coke works and iron and steel works (33 each), electricity works (32), aluminium works (14), and cement works (11).

The Inspectorate's task, it is pointed out, is to ensure that air pollution from a great variety of industrial processes is reduced to a minimum. Until 1958 it was mainly concerned with processes in the heavy chemical and allied industries, but in 1958 the scope of the Alkali Act was greatly extended to include many other operations; for example, iron and steel manufacture and electricity production, whose control of smoke, grit, and dust presented problems of special technical difficulty. Generally speaking, processes have been brought under the Act where emissions are particularly dangerous or offensive, or for technical reasons and where there is a particular difficulty of control

In Scotland, states the report, the scale on which fume treatment has to be undertaken is not always easy to appreciate and the results may be overshadowed by other discharges of long standing. Fume treatment for an open-hearth furnace may be in the order of £100,000. The expensive treatment at smaller furnaces, such as are used in the steelfoundry industry, will be less, but still substantial. In the view of the Chief Inspector for Scotland (Dr. E. A. Balfour Birse), the overall cost to the iron and steel industry there seems likely to be several million pounds, spread over a period of years. It is, he says, greatly to the credit of the industry that this onerous task is being faced with determination and goodwill.

New Mechanical Research Laboratory for C. A. Parsons

FOLLOWING the commissioning of the laboratories at the nuclear research centre at Heaton just over two years ago, C. A. Parsons & Company, Limited, has just completed the construction and equipping of a new mechanical research laboratory. Some of the equipment will serve not only the company's interests but will meet a national need.

The opening ceremony last month was marked by Mr. J. L. Gray, turbine plant design engineer of the Central Electricity Generating Board, setting "Bess" to work. "Bess" is a very modern experimental steam turbine designed particularly to investigate the performance of low-pressure blading.

IN THE STEPS OF

James Brindley

by D. W. HORSFALL*

POWER for Britain's industries: on the availability of such power her greatness rests. In the early 18th century the loads of only a few hundredweight of coal borne on the backs of stumbling packhorses could never have sustained the appetite that the furnaces of industrial Britain were to develop. In the mid 18th century the apparently irrelevant occurrence of the Duke of Bridgewater being crossed in love led to the foundations of Britain's industrial greatness being laid. In an effort to alleviate his anguish he turned his attention to developing his vast Worsley estates. There existed within these a "great mountain of coal," but the then packhorse transport to Manchester rendered its mining and sale a far from profitable activity.

Interested in the possibilities of canals, he employed a local mechanic, by name James Brindley, to investigate the possibility of building a canal from Worsley to Manchester. Brindley, the "unlettered but Heaven-taught genius," could barely read or write even to the end of his days, but this ex-millwright was responsible for some of the most astonishing feats of civil engineering that the world has ever known. The canals he designed are still used to this day; he designed the first tunnel on a through canal, and his Barton aqueduct stood for over 100 years across the river Irwell until it had to be demolished in the late 19th century to make way for the Manchester Ship Canal.

Perhaps, however, his most astonishing feats are still quite unknown, locked below the surface of the earth. The amazing complex of underground waterways which he devised at Worsley has been seen by but few, but a large portion of them is still navigable in spite of colliery subsidence and the erosion caused by over 150 years' exposure to the destructive humidity of damp colliery workings.

Recently I undertook a voyage on these waterways by the kind permission of the Area general manager of the East Lancashire Area of the North-Western Divisional Coal Board. We descended by the Ellesmere pit and, after a short walk along some very narrow brick-lined tunnels, came to—a canal! There, glistening in the light from our cap-lamps, was a narrow rust-red coloured stream about 8 ft. wide, with three boats awaiting us. At this point the workings opened out into quite a large cavern, but at each side the canal disappeared into a low, narrow tunnel. What completely bridged time were the boats themselves. There are many early prints showing the coal boats used in this system—long, narrow, heavily ribbed—and their modern descendants bear a striking resemblance to them; little wonder for they are still built in the yard started by the Duke of Bridgewater 200 years ago!

We climbed into the boats, with instructions to keep heads well down, and slowly they moved off. The boats were "legged through," that is, the deputy accompanying us lay on his back and walked against the ceiling, thereby propelling the boat. Slowly, slowly we went along through this narrow channel, at times passing the remains of the original coal boats; and while we went along something of the history of this system was described.

The ingenious Brindley had made these canals multi-functional. Due to the nature of the surrounding rocks constant drainage had to be adopted and that function had to be carried out by these canals. By driving them straight across seams he had indeed introduced horizon mining some 200 years before its general adoption! At the points where the seams were intersected, branch canals followed the seams along in order that the coal might be won from them, the boats going actually up to the coal face, and when this became impossible coal was loaded into baskets and dragged along to a suitable loading point for tipping into the boats. Consequently, the general shape of the system was of a herring-bone pattern.

The water constantly running out of the mine was retained at various points by way of sluices, called "cloughs." When a train of full boats had been mustered just above one of these cloughs, the gate was lifted and the boats flushed through by the current to arrive in the canal basin adjoining the main Bridgewater Canal. It is estimated that in about 1780 one lad could bring 21 of these boats, each carrying 7 tons of coal, twice daily from the mine—*i.e.*, 147 tons per trip (one of our more modern mines in this present year fetches 30 3-ton mine cars a similar distance, giving 90 tons per trip!) The water from the canal also kept the main line of the Bridgewater supplied for lockage purposes.

Gradually the system was extended: as the first canal went further and further into the earth it became more convenient to drive a second canal some distance above it to go further along and intersect coal seams at a different level, and eventually a third canal, below the level of the main one, was driven. The transport of coal from the upper to the middle canal was accomplished by a most

* Technical assistant to the chief coal preparation engineer, National Coal Board.

ingenious means: down Ashton Fields mine, which we visited, is the connection. We firstly saw the canal, which we were to voyage at a point some eight miles from its confluence with the Bridgewater Canal.

A steeply inclined plane connects the underground waterways, and after slowly climbing this, saw the start of the upper canal, now drained, but originally kept filled with water from a surface reservoir. Full coal boats were brought to the very end of the canal where there was a lock (the remains of which could be seen but only barely); water was let out of the lock, causing the boats to rest on the bottom of the lock, which consisted of the first part of the inclined plane. Thus there was no heaving of the boats over rollers to get them into such a position. Once on the inclined plane they slowly started to move down, controlled by rope haulage which, at the same time, pulled empty boats back up to the upper canal. Little effort: only water power. How much we still have to learn from these early engineers. The lower canal we were unable to see; indeed, means of access to it have now been lost. But the baskets of coal were put into the boat and hoisted up staple shafts (horse gin power) and emptied into the main level.

But to revert to the journey. We made several brief stops—one to see one of the cloughs, another to clamber up a coal seam and, in truly traditional manner, extract some that had been left in the pillar. The movement of the boat was assisted by the water flowing, but, save for the openings to seams and the branch tunnels, the head room was much restricted as colliery subsidence has taken place very considerably. In spite of this the brickwork is in first-class condition.

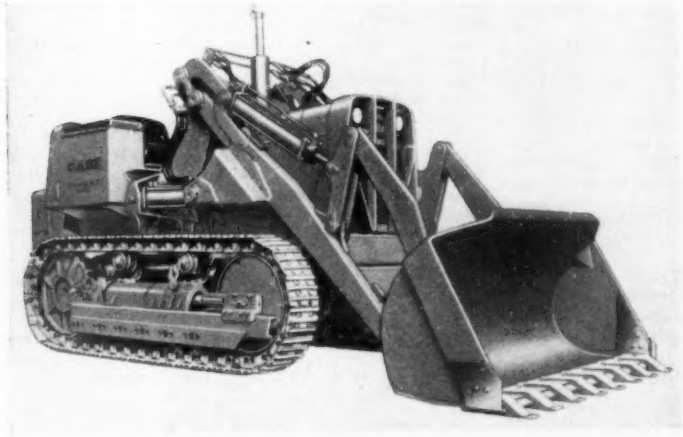
Suddenly ahead a pin-point of light could be seen. Slowly it grew larger and larger until we emerged into the bright sunlight illuminating Worsley Basin. A brief exploration of the canal facilities there, and the colliery van arrived, taking us back to an excellent meal and still further treasures—an inspection of some of the original account books kept by the Duke of Bridgewater's estate officer.

These marvels are barely appreciated, and yet upon the achievements of such engineers as Brindley the foundations of Britain's greatness rest. Their achievements should be fully known.

LOADER TO MEET MINING CONDITIONS

RECENTLY introduced into the UK by the J. I. Case Company, Limited, Mill Road, West Drayton (Middx), is a new track-mounted loader designed in the US for use in mines and tunnels. The loader, called the "Mining Special," is made in two models; one with an overall height of 6 ft. and recommended only where low clearance is a problem, and the other, with an overall height of 6 ft. 7 in., specifically designed for high production for applications where overhead clearance presents no problem.

Both loaders were developed to meet mining conditions and are powered by JD-382, four-cylinder diesel engines developing a maximum horsepower of 100 at 2,000 r.p.m. They are fitted with special drive that provides independent power control of each track giving a 10-ft. 6-in. radius counter-rotating turn with one track in forward and one in reverse and permitting turning in narrow mine passages. Torque converters are fitted which automatically adjust speed and power to the load and provide increased force for bucket crowding and breakout.



THE STANDARD CASE "MINING SPECIAL" LOADER.

Types of Steering

The bucket fitted to both models has a heaped capacity of 1½ cu. yd. and it has a clearance at maximum lift of 14 ft. 6 in.

Four types of steering are to be offered:—Full power turns for turning full loads in mud; counter-rotating turns for extra sharp fast turns in close quarters; brake turns for conventional pivoting; and gradual turns for making minor directional changes without track locking.

New Literature

HOUSE magazines, catalogues, booklets, etc., received include those referred to below. Readers wishing to obtain a copy of any of the items should write to the address given, at the same time mentioning this journal.

GEORGE COHEN 600 GROUP, LIMITED, Wood Lane, London, W.12—Most of us are familiar with the scope of the activities of the 600 Group. Nevertheless, "Products and Activities," a brochure issued to provide an up-to-date outline of the scope of the various companies in the group, will serve as a constant reminder.

JAMES GORDON & COMPANY, LIMITED, Dalston Gardens, Stanmore (Middx)—Catalogue No. 163 deals in some detail with the company's Mono gas analysis recorders for two and three constituents and also gives various notes on other types of Mono recorders available. The Gordon range of pneumatic servomotors and their uses is covered by catalogue 131.

INCANDESCENT HEAT COMPANY, LIMITED, Cornwall Road, Smethwick, Birmingham—"Nitrogen and Hydrogen Plants" (bulletin No. V68) has been prepared and published by the company's gas atmospheres division. The company built its first nitrogen plant in 1945 after many years' experience in exothermic plants for bright annealing. Since then over 800 special atmosphere plants have been built in various parts of the world.

CRODA, LIMITED, Cowick Hall, Snaith, Goole (Yorks)—Gelanol, formulated to overcome the disadvantages of the normal liquid rust-preventing compositions usually applied to bright-drawn bars, rods, etc., is the subject of a new technical data sheet. Gelanol is a combination of lanolin derivatives, gelling agents, corrosion inhibitor, and mineral lubricating oils. Two main grades are available, one for use in winter and one for summer use.

BROKEN HILL PROPRIETARY COMPANY, LIMITED, Melbourne, Australia—News of Broken Hill's activities is never lacking, and each issue of the BHP Review presents an interesting survey of the company's current and future affairs. Among the technical contributions in the April issue are "Steelmaking with Oxygen," by F. G. Hubbard, works research officer, Newcastle Steelworks, and "Blast Furnace Converts to High Top Pressure," by V. Rule, technical assistant, Port Kembla Steelworks.

W. H. ALLEN SONS & COMPANY, LIMITED, Bedford—Various items of the company's equipment are featured in articles in the June issue of Allen Engineering Review. Circulated with it is a paper on "The Application of High-powered Epicyclic Gearing for Industrial and Marine Use," presented at a meeting of the British Gear Manufacturers' Association and based on a paper of the same title presented to the Engineering Institute of Canada. The authors are H. Norman G. Allen, deputy chairman and joint managing director, and T. P. Jones, chief engineer and manager, gearing department.

GEORGE COHEN 600 GROUP, LIMITED, 600, Wood Lane, London, W.12—Recently George Cohen's paid a visit to No. 10, Downing Street. No. 10 is now under extensive reconstruction by the Ministry of Works, and the visit was made in order to remove some scrap. Intrigued by reports of this operation, the 600 Magazine "plunged recklessly in the British Museum Reading Room and eventually emerged with some interesting facts about this very historic address, its builder, and some of its former occupants." The result of the research appears in the magazine's summer number, which contains the variety of content long associated with this very entertaining publication.

THOS. FIRTH & JOHN BROWN, LIMITED, Atlas Works, Sheffield 4—"It is like entering another world to walk the short distance from the busy shopping centre of Sheffield to Exchange Street, and hear talk of boats and tides, and to see thousands of tons of material arriving by barge for the city's use. Large quantities of timber and bulk grain can be seen arriving on any day. The 90-ton barges come into the heart of Sheffield carrying such cargoes for Firth Brown as ferro-silicon and ferro-chrome." This, the story of the large motorized barges which leave Hull daily for Sheffield, is told by L. A. Edwards in the summer number of Firth Brown News (3d.) and is illustrated by several excellent photographs. It is one of a number of features in this well-produced magazine.

ANGLO AMERICAN CORPORATION OF SOUTH AFRICA, LIMITED, 40, Holborn Viaduct, London, E.C.1—The mining industry remains the economic stay of Southern Africa, despite enormous strides in industrial development during recent years. "Modern Mining Practice" is the title of an article appearing in Optima, a quarterly published by the corporation "in the interests of mining, industrial, scientific, and economic progress." The first part of the article, which has been compiled by the corporation's consulting engineers, appears in the June number. Other features of the issue include "Cornelia Colliery's Record Output." The South African record for coal production mined underground—and British and European records on a comparable basis—were broken by Cornelia Colliery's production for 1960. Production amounted to 4,089,432 tons. It is emphasized that this is not a world record, for the Robena mine in Pennsylvania produced 4,303,146 tons in 1957, while it is known that some of the coal mines in China and in Soviet Russia produce very large tonnages of coal.

APPLEBY-FRODINGHAM STEEL COMPANY (branch of the United Steel Companies, Limited), Scunthorpe (Lincs)—"At the very moment that you are reading these words, there is almost certainly at least one named train speeding along the rails of the East Coast main line between London and Edinburgh. If there is not, you are one of the few who can find time for reading between 7.30 and 7.50 a.m., and even during these 20 minutes, three named trains are approaching the junctions of Retford, Doncaster, and Northallerton on their way to the Great Northern main line." Despite the hard things we find to say about our railways from time to time, most of us have some affection for them and many people, of course, find the subject of absorbing interest. A contributor to the summer number of Appleby-Frodingham News (3d.) writes on "Named Trains on the East Coast Main Line." We have quoted his opening sentences above. By us the article—all 19 pages of it—was read with much interest and enjoyment. And just to round things off there is an extended "pull-out" diagram showing the paths of the trains. Space does not permit mention of other features of this excellent magazine, but we can assure potential purchasers of it that they do not have to be interested in railways to get their money's worth.

A NEW PROTOTYPE low-temperature carbonization plant for the production of smokeless domestic coke has been opened at the Central Fuel Research Institute, near Dhanbad, Bihar, India. The plant has been erected at a cost of Rs. 1,000,000. Besides the production of domestic coke, the plant can, if required, be used as a gas plant or for the production of coke for ironmaking and other purposes.

QUARRYING IRONSTONE AT CORBY

Progress Report from Cowthick Quarry

STRIPPING overburden to a depth of 100 ft., at the rate of over 1,700 ton/hr., the W1400 walking dragline at Stewarts and Lloyds' Cowthick quarry, Corby, is now nearing the end of its first full year's operation, this 1,750-ton machine having been brought into operation with the Priors Hall W1400, to which it is almost identical.

The Northampton sand ironstone, the Jurassic formation on which these machines are employed, provides approximately half the total UK production of iron ore, the ore being of variable lime and silica content, but generally siliceous. The iron content is from 28 to 32 per cent. and is phosphoric, thus being particularly suited to the basic-Bessemer or Thomas steelmaking processes. Generally, the ironstone is overlain by Lower Estuarine clays of the Lower Oolite series, this formation varying in thickness from 4 to 35 ft., and being followed in turn by Lincolnshire limestone of variable hardness and of varying depths of up to 130 ft.

The dip of the beds is fairly even, being generally at a low angle to the south-east, although local variations occur. The beds are, however, intersected by numerous faults, the throws ranging up to 40 ft. A continuous prospecting programme is maintained to provide advance data for the planned production of a number of differing grades of ore which are blended to meet furnace requirements. This programme is carried out with Consolidated Pneumatic Reich rotary 600 drills, drilling 6-in. dia. holes, and Ruston-Bucyrus 22W drills, drilling 6-in. dia. holes.

Accommodating Increased Overburden

In developing the face at Cowthick Quarry, the need to accommodate increasing volumes of overburden as the workings are carried down under deeper cover has given rise, in certain cases, to a system which employs a continually shortening face and thus, where possible, workings are opened along two sides of a square or in the shape of a horseshoe.

The limestone which overlies the clays requires fragmentation before stripping by the large draglines or electrically operated face shovels of some 9 cu. yd. capacity and, where conditions are suitable, a horizontal method of drilling has been evolved, the basis of which consists of horizontal rotary drilling in the clay or sand formation below the limestone bed with a McCarthy 6-in. auger drill mounted on an excavator chassis. This method is subject to the base of the limestone being within the limits of the maximum and minimum height of the drill as governed by its mounting on the excavator chassis.

The holes are drilled some 80 ft. in depth and are spaced at varying intervals from 14 to 22 ft. apart, each being charged on average with 110 lb. of open-cast gelignite. The charges are Cortex fired, three at a time, with 17 m./sec. delays. A 50-ft. width of working is thus fragmented at one time, with a previously fragmented 30-ft. width acting as a buffer. Where the use of this method is not possible, vertical drilling employing C. P. Reich rotaries or Ruston-Bucyrus 42T churn drills is used.

The size and capacity of the machines employed for stripping overburden from the iron ore of the Northamptonshire formation is particularly illustrated by the dragline installed at Cowthick quarry near Corby. This machine, the Cowthick W1400, designed and built by Ransomes & Rapier, Limited, had the largest operating ranges of any walking dragline in the world at the time of its completion. It has a dumping radius of some 275 ft. and a cycle time of 60 sec., the slowing speed at the head of the 303-ft. tubular boom being in excess of some 25 m.p.h. A number of different types of bucket have been used with the machine, ranging in capacity from 19 to 22 cu. yd., the latest 22-cu. yd. bucket weighing 20 tons empty and carrying approximately 30 tons of material when full.

A cross hatching of Cooper & Turner Diadem "Agate 600" hard surfacing is applied to protect the bucket and teeth at points of maximum abrasion, at the undersides of the leading edges and between the teeth. The "Agate 600" electrode is a low-hydrogen electrode depositing a Cr Mo steel in the hardness range 600 to 700 d.p.m., which is not changed appreciably by heat treatment.

The overburden is cast in dragline operation in rows parallel to the working faces, this resulting in a ridge and vale effect. While most of this is returned to agriculture, a small proportion is reafforested and is producing excellent timber. The portion restored to agriculture, mainly within several thousand yards of the fixed end of the face, has its topsoil removed and stored before stripping. After the overburden has been stripped, cast, and levelled, the topsoil is returned by scrapers and frequently a better pasture is obtained than originally existed due to the improved drainage characteristics of the new subsoil as compared with

the extensive clayey subsoil areas overlying the limestone.

The ironstone beds exposed after stripping are fragmented before loading, the drilling being carried out generally at 5-ft. centres by wagon-mounted drifters drilling 2-in. dia. holes.

In some quarries, the compressed air for the ironstone drills is derived from a ring main supplying the face, while in others, where trucking is being carried out, the air is derived from Consolidated Pneumatic "Power Vane" compressors of 210 cu. ft. capacity. Each hole is charged, on average, with 2 lb. of high explosive, the holes being fired electrically with ½-sec. delays. Loading out is effected by large face shovels, these being commonly Ruston-Bucyrus 100/120 R.B. excavators fitted with Ward Leonard control. These load to ore wagons of 20 to 30 tons capacity, and while at Cowthick the haul is 6¼ miles, the haulage distance from quarry to works varies from 1 to 6 miles. Up to the present, haulage is by steam locomotive, although experiments have been carried out with diesel-powered locomotives. Each train comprises some 14 to 18 wagons, having a total ore load of about 400 tons.

The Patent Office in 1960

AS in other years, the Comptroller-General's annual report on the work of the Patent Office in 1960 refers to the continued increase in applications for patents and trade marks and in applications from other countries. More than half the complete specifications to be examined now come from abroad. Despite the rise in the number of complete specifications to be examined, there were 1,759 more than in 1959, the arrears of unexamined specifications had fallen nearly 400 by the end of the year.

The Comptroller refers to public comment about the length of time it takes to obtain a patent. He points out that although the initial delay in the Patent Office is still too long, the office is not responsible for the three to three and a half years after the filing of the complete specification which is often quoted as the time needed to obtain a patent. If the applicant deals promptly with questions raised by the office an application can be accepted and published within 18 months; 50 per cent. of the applications are, in fact, accepted within two years.

Copies of the report, "Patents Designs and Trade Marks—78th Report of the Comptroller-General for the year 1960" (House of Commons Paper 197), can be obtained from HM Stationery Office, Kingsway, London, W.C.2, price 1s. 6d. (by post 1s. 8d.).

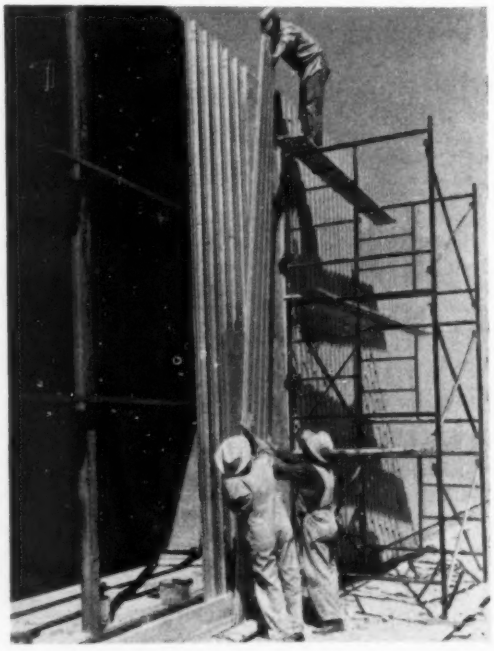
STEEL SIDEWALL PANELS ASSEMBLED DURING ERECTION

LOW-COST insulated steel sidewall panels that are assembled during erection in the field have been announced by the Republic Steel Corporation, New York. The panels are constructed by sandwiching a layer of insulating material, such as fibreglass, between two sheets of 24-in. "Ferrobord" or galvanized ribbed siding. According to the company, the assembled panels have a heat transmission coefficient of 0.18.

Uses for the steel sidewall panels extend to office buildings, warehouses, schools, and all other types of commercial and industrial structural frame buildings. Year-round working and storage temperature problems are said to be reduced by insulating the panels with 1-in. thick No. 6 density fibreglass which has a vapour seal on the interior face.

The steel panels are furnished, painted or galvanized, in widths of 2 ft. and up to 40 ft. in length. The company says that the long lengths and the absence of horizontal joints offer savings in erection time, and a neat, trim surface. Interlocking side joints are so designed as to blend with the fluted design of the panel.

Painted panels are fabricated from prepainted stock to protect against rust, cracking, abrasion, and weathering. Galvanized panels are designed to meet the specification of the American Iron and Steel Institute. Gauges range from 18 to 26.



STEEL SIDEWALL PANELS ARE ASSEMBLED DURING ERECTION ON A BUILDING THAT WILL HOUSE THE TELEVISION STATION KNOP, NORTH PLATTE, NEBR. THE OUTSIDE FACING SHEET IS SHOWN BEING FITTED TO COMPLETE THE WALL WHICH IS FORMED BY "SANDWICHING" A LAYER OF INSULATION BETWEEN TWO SHEETS OF TRUSCON "FERROBORD."

Accidents at North-western Collieries

FEWER FATALITIES THAN IN ANY PREVIOUS YEAR

EIGHTEEN persons were killed and 118 others seriously injured in and about coal mines in the North-Western Division of the Mines Inspectorate during 1960. This was substantially fewer than the average for the previous three years of 35.3 fatalities and 156.7 serious injuries. Indeed, the number of fatal accidents is the least that has occurred in any year in the history of the division. Despite the contraction in output, states Mr. R. H. Clough, Divisional Inspector, in his report under the Mines and Quarries Act, 1954 (Stationery Office, 2s. 6d.), the frequency rate for deaths, at 1.37 per million of saleable coal, is lower than ever before. The fatality rate per 100,000 manshifts, at 0.17, is substantially better than of recent years.

Output of saleable coal in the division was 12,936,238 tons, compared with 14,024,963 tons in 1959. This reduction of nearly 1,100,000 tons is a measure of the contraction which has taken place, the Inspector states.

Improved efficiency is indicated by an increase in the output per manshift at the face from 70.4 to 78.2 cwt., while the overall output per manshift rose from 25.1 to 26.5 cwt. The total number of persons employed in the industry at the end of the year was 43,516, or 5,084 fewer at the end of 1959. There is a total of 80 coal mines in the division.

Accidents from Falls of Ground

Five deaths and 18 cases of serious injury occurred from falls of roof at the face working. Of these, two of the deaths and three of the injuries were on prop-free front faces. Both fatalities demonstrated the inflexibility of prop-free front systems of support when abnormal conditions are encountered such as small-scale faulting, which, even though it may not prevent continuity of face advance, does disturb continuity of support. In one case, the physical conditions upon which the support system was based changed rapidly, and locally, without appropriate adaptation of support to the new circumstances.

A fatal accident occurred behind a disc-shearing machine after it had cut through a length of face disturbed by a small trough fault. The effect of this fault was to remove the usual top coal protection to a friable roof above, and as a result there was a fall of roof about 25 ft. long between the last rows of supports and the face. The victim of this accident was not caught by the fall, but was so near as to be so startled that he fell, striking his head on the face conveyor structure.

The other occurred after a holiday stand during which the face had not moved for four days. In this case, a disc-shearing machine had cut through a fault area which had been further weakened by the presence of water. There was a subsequent fall from over the whole width of the face working discharging two rows of link bars. Some additional support had been given in this case by a filled chock on the waste edge, but further support should have been given to the hades of the fault.

Persons Killed and Reportably Injured in Mines of Coal in the North Western Division during 1960 Compared with the Average for 1957-59.

Classification of accident.	Killed.		Seriously injured.	
	1960.	Average 1957–59.	1960.	Average 1957–59.
UNDERGROUND				
Faceworking				
Falls of roof	5	5·7	18	23·7
Falls of face and side	—	4·0	13	20·7
Other falls	3	5·3	22	19·9
Total falls	8	15·0	53	64·3
Haulage and transport	4	9·0	32	40·7
Miscellaneous causes	4	9·7	20	36·4
Total: Underground	16	33·7	105	141·4
Surface	2	1·6	13	15·3
Surface and underground	18	35·3	118	156·7

One of the three other fatal accidents occurred at a face transfer point in circumstances similar to those of a roadhead. Support was by long girders bridging the delivery and return drum of the two conveyors. These girders were double-propped and had cross-bars. Due to some instability, probably precipitated by the weakening of the floor by "dinting," there was a heavy fall of

roof which discharged three of the long girders, and killed one of a group of workmen nearby. It was known that one of these girders had been distorted when first set, but the precaution had been taken of setting a small chock under it.

Features of many of the non-fatal injuries were the setting of bars with only one prop, failure to set temporary props, and delay in setting supports at all.

Falls of Side at the Face Working

There were no fatal injuries from falls of side at the face working, but there were 13 cases of serious injury, two on prop-free front faces. Those at other faces were from overhanging coal which should have been supported or removed.

The risks accompanying the movement of men on the face side on prop-free front faces received a good deal of attention during the year and has been a main subject of discussion between the members of the Falls of Ground Advisory Committee. The Inspector is optimistic of the effects of certain measures being taken in reducing the amount of casual movement on the face side. These include:—(1) More rapid advance of the conveyor by hydraulic rams after stripping; (2) greater scavenging action by ploughs to reduce the manual removal of loose coal in the new conveyor track, and (3) changes in shearer drum design to secure, among other things, more efficient loading.

Other aspects of falls of coal, which apply equally to all longwall faces, should receive more attention. These are:—(*a*) Avoidance of irregular face lines and rates of advance; (*b*) the relation of face line to cleavage, and (*c*) cut coal standing too long before being stripped.

Underground Fires

Eleven instances of underground fire were reported and investigated. None caused injury to persons, and prompt action prevented any from becoming serious. Two were associated with roadway belt conveyors. In one, the most inbye unit of a trunk system of such conveyors was inadvertently left unattended and running when a small group of men left the district at the end of the shift. Signs of fire met the incoming shift, and it was found that the conveyor belt had stalled and that frictional heat had destroyed about 4 yd. of the fire-resistant belt without any surrounding material taking fire. While this is reassuring evidence of the value of fire-resistant belting, it also reveals again the danger of leaving districts containing machinery unattended, without a final responsible examination when all work has finished.

The other instance occurred from a conveyor belt getting out of line due to collapse of its supports, causing it to rub against the fixed structure. Similarly, this trouble appears to have developed between one shift leaving the district and the entry of the succeeding one. This last case illustrates the insidious nature of frictional heating in the presence of fine coal dust. There is no substitute for careful maintenance, cleanliness, and vigilant patrolling. Three further small fires occurred at the booster drives of roadway conveyors due to frictional heat of the linings of the thruster brakes. In all three cases the suspected cause was maladjustment of the brake linings associated with the presence of oil and coal dust, or other inflammable material.

Air Compressors

The potential fire and explosion risks associated with underground air compressors do not always seem to be appreciated by those charged with their care and maintenance. While most of them are provided with thermal protective devices, there is always a danger that oil vapour may be carried over from the machine. Consequently, the use and maintenance of pipeline filters is desirable.

The use of horses below ground, states the report, is still confined to Point of Ayr Colliery in North Wales, where the number so employed is now reduced to 19.

Book Review

Guide to the Coalfields, 1961. Edited by G. R. Strong and E. G. Corbin. 582 pp. Colliery Guardian Company, Limited, 30 & 31, Furnival Street, London, E.C.4. 20s.

IT so happens that there can be no such thing as a really up-to-date guide or directory. Before the last pages are passed for press, some entries will have been subject to change and, therefore, will not convey the correct information. Even giving the publication a date presents a problem; because what was true when the editors sat down to their task of compiling or bringing up to date, may be far from accurate when the printed and published volume reaches the reader.

Editors do their best by constant revision up to passing the last pages for press and including sections under such headings as "Addenda" or "Too Late for Classification," but even so the work can only be "approximately" up to date. This year's Guide to the Coalfields is as near up to date as is possible, even in this jet age, and the editors have not tried to achieve the impossible by including addenda.

In a preface they point out that pit closures and reorganization within the divisional structures have been responsible for the revision of this year's edition being more extensive than usual. In the Scottish and North-Western divisions the reorganization has resulted in a reduction in the number of Areas, while in other divisions there has been some regrouping of pits. Colliery maps now appear at the end of the entry for each division instead of in groups after the entry for the Area and—an excellent provision this—recently closed pits have been retained on the maps with the word "Closed" inserted under the name of the pit.

The Guide maintains the high standard of clarity, comprehensiveness and easy reference which one has come to expect over the years and, providing a moment's intelligent study is given to the explanatory notes, it is possible to find quickly information on almost any detail of that vast complex which is the British coal-mining industry today.

MOUNT ISA MINES, LIMITED, Australia's largest copper mine, has ordered a shaft tower and mine hoist equipment worth about £1,035,000 from the Swedish electrical engineering company, Asea.

Metallurgical Patents in the US

Some Recent Inventions

DESCRIPTIONS of metallurgical patents given below have been taken from details published in the Official Gazette of the United States Patent Office.

Apparatus for Feeding and Counting Billets

Apparatus for feeding and counting billets or the like comprises a conveyor, a scanning plate having substantially vertical holes therein located adjacent and positioned transversely of the conveyor, means mounting the scanning plate in fixed relationship with the conveyor, a carriage being mounted adjacent one side of the plate for movement transversely of the conveyor. A light source is arranged on the side of the plate and conveyor opposite the carriage and extending transversely of the conveyor. A photosensitive device is carried by the carriage, the conveyor having an opening therein permitting passage of light between the light source and the photosensitive device. Means provide for moving the carriage back and forth transversely of the conveyor, means operable by the photosensitive device indicating a count each time the photosensitive device receives light through a hole in the scanning plate. Means provide for turning off the light at the end of the scanning stroke and maintaining it off during travel of the carriage in the reverse direction.—2,975,969.

Furnace Closure

Apparatus for closing the entrance of a furnace comprising a pair of flaps each being made of a rectangle of flexible material with parallel edges folded together to leave a loop between them, and means to mount one of the flaps on each side of the entrance, the mounting means engaging the folded edges and being so spaced that the loop portions of the flaps engage each other at an angle. A pipe having a row of perforations therein extends through each loop, the perforations being directed toward the engaging portions of the loops, and means to supply air under pressure to each pipe, the force of the air escaping from the perforations holding the loops in engagement with each other.—2,977,106.

Heat-treating Furnace

A heat-treating furnace comprising a furnace heating chamber has entrance and exit doors at opposite ends and slide rails therewith over which work may be passed from the entrance door through the heating chamber and out through the exit door. A loading rack in front of the furnace entrance door is provided with two pairs of vertically and horizontally movable push rods for engaging work placed upon the loading rack, one pair of push rods serving to push the work along the loading rack automatically into the furnace upon the opening of the entrance door and the other pair of push rods serving to push the work out of the furnace through the exit door after a heat-treating operation. A cooling chamber adjoins the exit door of the heating chamber, the second pair of push rods serving to move the heat-treated load from the heating chamber past the exit door and into the cooling chamber. Motive means move the pairs of push rods vertically and horizontally to effect the desired movement of the load through the furnace, the cooling chamber having an unloading door for enabling the removal of the work load therefrom. A flame curtain protects the furnace entrance and at the cooling chamber unloading door for preventing cold atmosphere detonation of controlled atmosphere gases within the furnace and cooling chambers.—2,977,107.

Continuous Casting Apparatus

In a starting device for the continuous casting of hollow bodies by means of a mandrel located within a vertical through-flow mould open at both ends, the space between the mandrel and the mould wall is closed before casting is started by means of a starting head against which the casting is initially formed, the casting head being gradually withdrawn as casting progresses. The starting head has at least two plates upwardly directed from its face against which casting is initially formed to provide at least two initially separate portions in the initially formed portion of the casting, the plates extendng radially from the mandrel to the mould wall.—2,976,585.

Method of Casting and Stripping in Production of Steel Ingots

In combination with a roller bed, carrying sectional ingot moulds, means are associated with the roller bed whereby sections of the mould may be moved towards each other thereby forming a complete mould for receiving molten steel and moved away from each other thereby stripping the mould sections from the ingot formed therein and permitting the ingot thus formed to drop onto the roller bed. A movable ladle of molten steel mounted over the mould deposits molten steel in the moulds.—2,976,586.

Tuyere Assembly for a Bessemer Converter

A bottom assembly for a Bessemer converter comprises a detachable bottom ring having an opening through the bottom thereof, a wind box attached to the bottom of the bottom ring, the wind box having an opening through the top thereof aligned with the opening in the bottom ring, a tuyere plate mounted being aligned with the openings adjacent the top of the wind box. The tuyere plate has a plurality of vertical openings throughout, a shoulder in each of the last named openings, the cross section of each opening having greater dimensions above the shoulder than below the shoulder. A false plate is arranged above the tuyere plate in spaced relationship therewith, the false plate having a flat upper surface and openings therein aligned with the openings in the tuyere plate. A tuyere is provided for each of the openings in the tuyere plate and false plate, each of them having an elongated refractory body with a plurality of generally vertical holes therethrough, the outside dimensions of the bottom portion of the body being

greater than those of the remaining portion so as to provide a shoulder between, the bottom portion of each of the tuyeres being received in the openings in the tuyere plate and false plate and resting on the shoulder of the tuyere plate with the tuyere shoulder positioned at least at the top of the false plate, and a refractory filling in the bottom ring on top of the false plate around the tuyeres and on the tuyere shoulders.—2,977,108.

Method and Device for Casting Steels and Other Ferrous Compounds in Ingot Moulds

An improved process of casting a ferrous product in an ingot mould, comprises the steps of: placing in the mould a sheath capable of being destroyed progressively but with a slight delay by a molten metal bath, closing the top of the ingot mould around the sheath, creating a high vacuum within the sheath and also in the ingot mould, then pouring the product into the mould by means of a pouring jet passing inside the sheath, maintaining the high vacuum at the start of the pouring, and finally, during subsequent pouring and during the setting of the ingot, effecting separate controlled exhaust in the sheath and in the ingot mould to degasify the molten metal by regulating separately the pressures of the gaseous mixtures emanating from the pouring jet and product, respectively, in the sheath and the mould between which the sheath which is being destroyed insures a seal due to the delay in its destruction.—2,976,587.

Shell Mould and Method of Manufacture

A mould for use in precision casting relatively heavy articles comprises sand cope and drag members, at least one of the said members being moulded about an insert forming at least a portion of the mould cavity surface, the insert comprising a composite mould structure having a first facing layer formed of a major proportion of sand and a minor proportion of thermo-setting resin and a second supporting layer formed of a major proportion of sand and a minor proportion of thermo-setting resin. The resin content of the second layer is substantially less than the resin content of the first layer, both layers being simultaneously cured and bonded together while the first layer is in contact with a metal pattern.—2,976,988.

Method of Making Hollow Shell Cores

A process for producing a hollow shell-type foundry core comprises heating a metal core box to a temperature of about 250 deg. F. to 800 deg. F., depositing a sand-resin mix onto the interior surfaces of the core box to form thereon an adherent sand-resin layer of predetermined thickness, inserting a nozzle into the core box and forcibly blowing a substantially uniform stream of hot gas through the nozzle and into the layer for a time sufficient to cure it while simultaneously applying heat through the core box to the surfaces of the layer which abut the core box, the gas being at a temperature between 350 and 1,300 deg. F. when blown into the layer.—2,976,589.

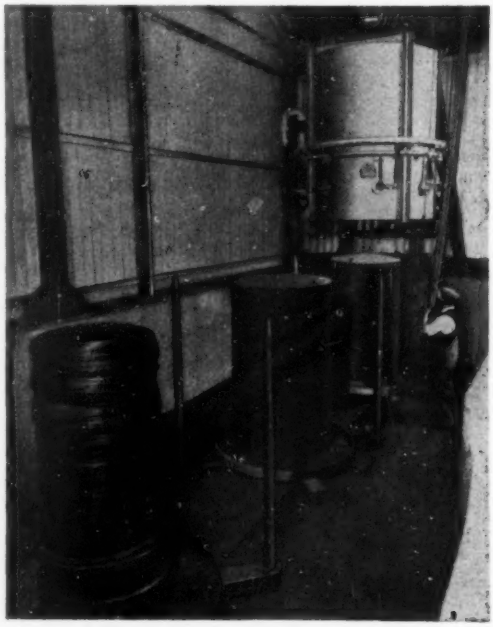
Preventing Loose Screws and Nuts

Designed to cure the familiar problem of how to deal with screws, nuts, etc., which habitually work loose, "Loctite Sealant," a liquid plastic sold in handy polythene tubes, is now available to the general public. An American product, distributed in this country by Douglas Kane (Sealants), Limited, 243, Upper Street, London, N.1, it has been used extensively in industry for some time.

Furnace Installation Problem Overcome

PROBLEM of installing lift-off furnaces in a building with limited headroom has been overcome at the Victoria Works, West Bromwich, of Wire Drawers (Midlands), Limited, where the furnace bases are placed in a well. Lifting is by a hoist from a beam supported by "A" frames, one of which can be seen in the photograph. There is enough clearance to move the furnace, inner covers, and the spiders loaded with wire.

The plant is being used for stress relieving and



A LIFT-OFF FURNACE AT THE VICTORIA WORKS OF WIRE DRAWERS (MIDLANDS), LIMITED.

annealing of coiled wire and narrow strip, outputs up to 750 lb./hr. of steel wire at a temperature of 700 deg. C. depending upon loading.

Lift-off furnaces manufactured by the Incandescent Heat Company, Limited, Smethwick, Birmingham, are in use in many parts of the world for ferrous and non-ferrous wire, sheet, and strip, and for the heat treatment of castings.

ON INSTRUCTIONS from the Minister of Mines, the new mining areas recently discovered in Chile by the Instituto de Investigaciones Geológicas during its explorations in the northern provinces are shortly to be sold or leased. The Government wishes these areas to be worked as soon as possible.

EXHIBITION OF USSR PRODUCTS

Promoting Anglo-Soviet Trade

The main purpose of the Soviet Exhibition, which opens at Earls Court, London, today (Friday), is to show export and import possibilities in the further expansion of Anglo-Soviet trade. In addition, the display illustrates clearly the vast technical revolution which has been taking place in the USSR for many years.

LIKE the British Trade Fair, held in Moscow during May and June, the reciprocal Soviet Exhibition at Earls Court is a trade and industrial display. It will close on July 29. The Russians aim to show Britain their export and import possibilities in the further expansion of Anglo-Soviet trade.

Under the joint sponsorship of the Association of British Chambers of Commerce and the Chamber of Commerce of the USSR, the Soviet exhibition is the first ever to be held in London. The total area occupied by the display exceeds 250,000 sq. ft. and is 30,000 sq. ft. larger than the Soviet pavilion in the World Exhibition in Brussels in 1958.

In order to give the visitor a full picture of Russian possibilities and requirements, the exhibition is split up into nine principal sections—science, industry, transport, building, agriculture, education, public health, consumer goods, and culture. An additional introductory section will display the main general indexes of Soviet economic development. The sections occupy 22 halls in Earls Court and house over 10,000 exhibits.

More than 300 Russians are available as guides and interpreters.

Scientific Section

In the scientific section in the entrance hall, visitors can see apparatus and instruments used in research. One item of particular interest is the apparatus designed at the Institute of High Pressures (Physics) of the USSR Academy of Science, showing how the structures and properties of material at high pressures are studied with the help of ultrasonics and X-ray radiation. The achievements in this field of physics have already led to the synthesis of extremely hard substances which are superior in their thermochemical properties to the hardest natural materials, showing a two- and three-fold increase in the mechanical strength of some metals.

The Soviet optics industry is also represented in the scientific section. Various optical instruments of industrial and scientific importance are shown, such as the microphotometer, theodolites of various designs, and a large group of spectrometers to determine the optical density of transparent substances.

In the field of the generation and distribution of electricity, is a huge illustrated map showing the power stations under construction, planned stations, and transmission lines. Also on display is a 6-metre model of the Bratsk hydro-electric power station with a capacity of 4,500,000 kW. There is also a model of a steam boiler which can produce 900 tons of steam per hour.

In the section devoted to the coal-mining industry, equipment and apparatus used in stope entry headings, shaft sinking, and for transporting minerals are presented. Specifically, the display includes units for operation in longwall faces working level seams 0.8 to 1.8 m. thick, and for inclined seams with a thickness of 1.6 to 2.6 m.

Some of the world's largest blast and open-hearth furnaces are being built in the USSR, and the section on industrial construction shows the developments in this field. Models of blast and open-hearth furnaces, rolling mills, and samples of the output of Soviet iron, steel, and non-ferrous metals demonstrate the potentialities of the metallurgical industries. The displays include models of a 2,000-cu. m. blast furnace, an electric steel melting shop with installations for the continuous pouring of steel, and diagrams of six rolling mills, together with a working stand of a steel mill with automatic devices. A diagram of a mill for the furnace welding of pipes and of a tube rolling unit for seamless pipes give an idea of Soviet tube manufacture.

Mineral Industry Statistics

The "Statistical Summary of the Mineral Industry" is an annual publication of statistical tables showing world production, exports, and imports of all the important economic minerals, metallic and non-metallic, including the mineral fuels coal and petroleum. The latest edition gives information for the six years 1954 to 1959 and contains over 200 tables relating to more than 60 commodity groups. Coal tables contain information on anthracite, bituminous coal and lignite, coke, briquettes, and the principal distillation products. No other statistical publication contains such detailed information on world trade in minerals and metals, including not only the crude materials, but also the chief semi-manufactured products, refinery products, and other derivatives. It is obtainable from HM Stationery Office or through any bookseller, price £1 7s. 6d.

In Parliament

Tax Relief Refused for Tin Mining

SPEAKING on a new clause moved in the Finance Bill to give special income tax relief to the non-ferrous metal mining industry and particularly to Cornish tin, SIR EDWARD BOYLE, Financial Secretary to the Treasury, said Mr. Selwyn Lloyd had not found it possible to authorize a concession, although the Chancellor was in full agreement with the thesis that the fullest practicable use should be made of mineral resources.

Mining companies, said Sir Edward, already enjoyed a 20 per cent. investment allowance, and a 20 per cent. initial allowance, making 40 per cent. in all on all capital expend ture primarily connected with the extraction of ore. For a new tin mine costing £500,000, the profits would have to reach about £140,000 for any tax to be paid, and that figure included a tax-free bonus of £80,000 from investment allowances. If the Chancellor were to substitute a tax free holiday of three years for the exist ng arrangements, the mines would, on balance, be worse off.

A detailed geological survey had been carried out in 1956, Sir Edward said, giving sufficient indication of the locat on of the tin lodes, and the view was taken that further work would not be justified. However, the Chancellor was prepared to consider the matter again with the Minister for Science.

MR. GEOFFREY WILSON (Con.), said the world shortage and high price of tin made it an exceptional case among extract on industries, and the suggestion that anything done for the tin industry might be regarded as a precedent for other industries was not a proper argument. The argument that there was already a form of tax holiday in respect of non-ferrous metal mining did not hold, because existing forms of taxat on had not helped. If the present system of taxation was regarded as a holiday, it was not doing what the industry wanted, because it did not work.

The proposed new clause, sponsored by Labour members, was defeated.

Colvilles' Strip Mill Loan to be Reduced

AMOUNT of Government money in the loan agreement with Colvilles, Limited, for its strip mill development is to be reduced, MR. RICHARD WOOD, Minister of Power, said in a written answer to SIR PETER ROBERTS (Con.-Lib.). THE MINISTER said: "I told the House on March 23 that the capacity of this strip mill is to be about 500,000 tons of sheet a year, instead of about 230,000 tons under the original plan. The extended scheme is estimated to cost more than £60 000 000, of which the extension accounts for about £16,000 000. The company now proposes to raise about £15,000,000 by a rights issue."

MR. WOOD said that in these new circumstances, the company had agreed that the amount in the loan agreement would be reduced from £50,000,000 to £45,000 000. The remainder of the proceeds of the new issue would be absorbed by the extension of the strip mill scheme. "I have agreed that this remainder and the capital expenditure to which it is to be allocated will be disregarded in assessing the cash position of the company in connection with the review of the balance of the loan. This review will take place in the first quarter of 1962."

IMPORTS OF US COAL

ASKED when he expected to make a statement on the application of the Steel Company of Wales, Limited, to purchase coal from the United States, MR. REGINALD MAUDLING, President of the Board of Trade, said he hoped to make one before the House rose for the summer recess. MR. MICHAEL FOOT (Lab.) said he hoped that before accepting such a proposal, the Minister would "take into account the injury which the coal industry has suffered over several years, purely because of Government policy."

MR. DOUGLAS JAY (Lab) asked if the Board of Trade had recently received any application from SCOW to import cheap Russian oil. MR. MAUDLING said he thought the answer was "No," but could not be sure without looking into it.

DURHAM POWER STATION

TOLD by MR. RICHARD WOOD, Minister of Power, that no application had been received for consent to build a new power station on or near the Durham coalfield, MR. NORMAN PENTLAND (Lab.), stressed that such a station would be of great importance to the industrial future of the county and urged the Minister to consult again the Central Electricity Generating Board.

MR. WOOD said he knew of the concern felt in Durham and the North-East of England about this question, and he was sure that the Generating Board was continuing its consideration of suitable sites for power stations in the whole of the country.

NCB'S CAPITAL BORROWING

NET borrowing of the National Coal Board from the Exchequer, as shown in the recent White Paper on Government Expenditure Below the Line, was £2,200,000 in 1960-61, and was expected to be £12,000,000 in 1961-62, MR. RICHARD WOOD, Minister of Power, told MR. DAVID GINSBURG (Lab.).

Agreeing with Mr. Ginsburg that these figures showed a great reduction in borrowing from 1959, MR. WOOD said this was due chiefly to changes in the need for working capital of the board, which increased considerably in the first of the two years and decreased considerably in the second.

SCHOOL VISITS TO PITS

ALTHOUGH he was anxious that secondary school pupils should gain first-hand knowledge of the way the country's work was done, visits to coal mines were best left to local arrangements, SIR DAVID ECCLES, Minister of Education, told MR. EMRYS HUGHES (Lab.). Mr. Hughes had asked if he would issue a circular to education authorities suggesting that, where practicable, arrangements should be made for secondary school pupils to pay at least one visit to a coal mine.

"Does the Minister not think it would be a very useful part of anyone's education to crawl 300 yds. in a coal mine in a 4-ft. seam?" MR. HUGHES asked. Many members had never had that experience, and he suggested that, if the Minister would like to have it, he might agree to go with him, as the Eton boys had done.

SIR DAVID replied: "I have had this experience, and I enjoyed it."

IRON AND STEEL TRADE

AFTER a long period of prosperity, some sections of the heavy steel trade appear to be getting more and more involved in a position which, although one would hesitate to call it recessionary, is certainly leading to short-time working. Many rolling mills producing sections and joists, slabs, rails and piling, together with the billet mills catering for the producers of the lighter products, have already cut two shifts a week off their work schedules. Most iron and steel makers are now reconciled to waiting until after the holiday period before they can look for any material improvement.

Pig-iron

All grades of pig-iron are in good supply and no difficulty is experienced in obtaining the required tonnages. The low phosphorus irons are being taken up in substantial quantities by the engineering and speciality foundries, together with appreciable tonnages of hematite and some refined iron.

The high phosphorus irons are in steady demand by the light, jobbing, textile, and some of the engineering foundries, but the call is nowhere near sufficient to absorb available tonnages and producers are seeking as many oversea outlets as possible.

Ferro-alloys

There is some slight easing off in demand—always the case at this time of year—but a fairly steady call continues to be made on most items. Both the low and high carbon grades of ferro-chrome are of moderate interest and there is still a good demand for ferro-silicon. Ferro-manganese, and silico-manganese, and calcium silicide are fairly active.

Ferro-tungsten remains quiet, while ferro-vanadium and ferro-molybdenum are also a little quieter than of late, but some attention is given to ferro-niobium and ferro-titanium.

Semi-finished Steel

Most of the re-rollers could undertake much more work than that at present arising. Demand for small bars, light sections, strip, etc., shows no appreciable increase on recent tonnages and the mills find it difficult to maintain production at present levels. Those units producing reinforcing rods and bars, however, have plenty of work on hand.

Home steelworks are able to satisfy current demands for mild steel semis without difficulty and could supply much larger quantities than those now being called for. Carbon and alloy steel billets are also in better supply and many of the steelworks producing them are able to undertake fresh business.

Finished Steel

Demand for sections and joists is still well below normal and is more or less on a day-to-day basis as consumers are able, in the majority of cases, to obtain requirements from the weekly rollings owing to the large number of sizes now being rolled. Platemakers are finding the position easier and new business can be placed for plain, chequered, and floor plates for fairly reasonable delivery.

Competition between constructional engineers is very keen indeed due to many of the shops having capacity available with the result that prices and delivery dates have been pruned to the absolute minimum in order to secure the business—whether for small or large contracts.

Iron-ore Imports

IMPORTS of iron ore and concentrates (except chrome iron ore) and roasted iron pyrites in May, and the totals for the first five months of this year and last, are shown in the table below.

From	Month ended May 31.	Five months ended May 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Sierra Leone	48,020	347,259	251,763
Canada	190,313	505,050	337,115
Other Commonwealth countries and Eire	—	16,216	4,242
Sweden	512,547	1,840,474	2,194,756
Norway	36,974	140,330	145,215
France	37,728	251,993	211,780
Portugal	—	144,995	101,071
Spain	45,679	357,764	327,979
Algeria	166,497	912,323	665,322
Tunisia	57,035	368,842	203,489
Morocco (including Tangier) ..	69,725	380,320	246,798
Liberia	69,050	241,802	213,865
Venezuela	146,061	709,560	922,695
Brazil	61,878	287,371	330,367
Other foreign countries	47,391	312,009	286,005
TOTAL	1,483,898	6,816,308	6,442,462

UK Price of Nickel Raised by £60 a Ton

ANNOUNCING an increase in the price of refined nickel by £60 to £660 a long ton, the International Nickel Company of Canada, Limited, stated on Thursday of last week that the increase was to assist in offsetting higher and mounting costs since the company's last price rise four and a half years ago. As a part of the company's policy of stimulating the expansion of uses for its nickel in preference to other materials through providing steady prices for its customers over the longest possible periods, it had deferred any changes in its prices until this time.

The statement added that over and above cost increases, the discounts which had prevailed for the US dollar had meant a loss to the company of "a number of million dollars" in each of the past four years. Elimination of the discount would put a stop to this loss, and a premium for the US dollar would begin to compensate for past losses.

Following Inco's price increases, similar price advances have been signified by Sherritt Gordon Mines and Falconbridge Nickel Mines.

Coalfield News

Retired Miners' Free Coal Supplies Dwindle

EFFECT of the decision which makes it compulsory for miners to retire at 65, is that the Leicestershire "coal pool" which supplies retired miners and miners' widows with a free allocation of coal four times a year, is in danger of running dry. With fewer miners contributing part of their coal allocation to the pool, its resources are being drained by a corresponding increase in the number of retired miners.

Leicestershire Miners' Council decided last week that as it could not reasonably ask the men to increase their contribution, having already done so a year ago, families in receipt of free coal are to be asked to inform the National Union of Mineworkers when a change in circumstances makes them no longer eligible for it. "As this scheme was pioneered in the Leicestershire coalfields, it would be a tragedy if it were permitted to break down," said Mr. Frank Smith, the council's secretary.

A COAL SEGREGATION PLANT at Westoe Colliery, South Shields, is to be erected by Durham Divisional Coal Board.

NEW CAGE which was being fitted in the north shaft at Pleasley Colliery (Notts) last week fell part of the way down and was badly damaged. Some damage was also done to the shaft.

ACCORDING TO figures published on Monday, widows and dependants of the 44 miners who died in the Six Bells Colliery accident in June, 1960, have been paid a total of £10,033 in benefits.

THE National Union of Mineworkers is seeking a plot of land at Horbury, near Wakefield (Yorks), suitable for the erection of houses for aged miners. A site has been offered by the local council.

ABOUT 180 miners from Markham No. 4 Colliery (Derbyshire) are to be moved this month to the adjoining Ireland Colliery to help get ready the Three-Quarter Seam before the old Deep Hard Seam is worked out. Another 90 miners will be transferred from Markham to Ireland pit next month.

AT THE national first-aid and nursing final competitions of the St. John Ambulance Brigade in London last Saturday, the Welbeck Colliery (Notts) ambulance cadet team won the White Knox Cup, in which competition the Bentley Colliery (Yorks) team came sixth. In the Dewar Shield competition, South Kirkby Colliery ambulance team was eighth.

LOCAL OFFICIALS of the National Union of Mineworkers have taken up the case of about 120 aged miners and widows of former miners who have been without their free coal since the recent closure of Aldwarke Colliery, near Rotherham. It is hoped to get help from miners who were transferred to other pits when Aldwarke closed.

PRODUCTION WAS resumed on Monday at the new £10,000,000 Abernant Colliery, near Pontardawe (Glam), following the strike of 400 miners who ceased work on Wednesday of last week after 28 miners were sent out of the colliery by the management. It was alleged that the men were "going slow" while negotiations were proceeding in regard to a piecework price list.

TWO MINERS working in the cage used to hoist coal from the pit bottom at No. 2 shaft, Barony Colliery, Auchinleck (Ayrshire), narrowly escaped death last Friday when a fire, which started below the winding wheel, ate through the cables supporting the cage, which minutes later crashed empty to the bottom. No injuries were reported, but as a result of the outbreak 400 miners were sent home.

SPEAKING AT ALLANTON (Lanarkshire) Mr. William Welsh, general manager of the No. 4 (Central East) Area of the Scottish Divisional Coal Board, said: "Surface and underground tidiness in collieries leads to safety." He was presenting awards to Whitrigg Colliery, Whitburn, and Hassockrigg Colliery, Shotts, for tidiness above and below ground during 1961, and pointed out that while there was an upward trend in colliery accidents all over Britain, casualties in the Central East Area had decreased. Mr. D. J. Skidmore, divisional production director, said that a safety campaign would be conducted in the mining industry during 1962.

Lord Robens Talks to Miners on Haig Pit Development

CHAIRMAN of the National Coal Board, Lord Robens visited Haig Pit, Whitehaven (Cumberland), on Thursday of last week where he discussed with miners their resistance to electrification of the colliery. At a pithead conference after a three-hour tour underground, Lord Robens said: "Some of the Haig miners told me they wanted electrification. Others said they would agree if they could be assured it was safe, and those with the longest experience prefer not to have it."

He said there was a deep-seated fear among the older miners of Cumberland that electrification would endanger lives, but without electrification at Haig, Cumberland would not be able to meet its contribution to the national coal pool, and at the same time would be incapable of providing coal in sufficient quantity to meet Cumberland's own industrial and domestic requirements. Though the Inspector of Mines and an inspector appointed by the men had found Haig to be safe for the use of electric machines, the miners still had to be convinced.

After talks with officials of the Cumberland branch of the National Union of Mineworkers, Lord Robens said he would give a decision after consulting with experts.

US Coal Research Appointments

A NUMBER of appointments affecting US coal research are announced by the US Department of the Interior. As chief of the division of economics and marketing, Mr. Bernard S. Beckler will be responsible for projects in coal economics, market research, and analysis. Mr. G. Edward Larson, as chief of the division of contracts and administration, will be in charge of contract and administrative management of the coal research programme approved last year by Congress. He will also serve as administrative advisor to the director and other officials of the Office of Coal Research in the development of contractual agreements, administration of non-engineering phases and on matters relating to financial aspects of contracts administration.

Mr. Neal P. Cochran has been appjointed chief of the division of utilization and will be responsible for evaluating coal research proposals and for rendering staff support to the director in the area of providing new and more efficient methods of utilizing coal and coal products.

THE COAL TRADE

TRADE, within its seasonal limits, varies considerably so far as the house coal market is concerned. In the north, indifferent weather has led to disposals being fairly well maintained, principally for customers' day-to-day requirements. Further south it has slowed down almost to a standstill with neither householders nor merchants doing much about replenishing stocks. The same variation in availability of smokeless fuels is reported. In some parts of the country almost immediate delivery can be secured, but in parts of London and the south delays are fairly common.

SCOTLAND

Glasgow—Some very poor holiday weather this year has been reflected in an increase of around 20 per cent. in returns of merchants' disposals. The widespread belief is that the extra tonnage sold was for current consumption and not for stockpiling. The biggest increases took place in coast and country districts, suggesting that a cheery coal fire has been one means of countering the effect of the bad weather at holiday resorts.

Notwithstanding the improved trade there is still a surplus output of large coal which is having to be put on the ground at the collieries. Distributed stock is already at the peak figure reached last year just before the start of winter, and it seems most likely that the total will rise in the coming months because of a sharp reversal in the demand for coking coal.

After intense efforts to secure sufficient tonnage to tide them over this month's holiday at the steelworks, coke-oven managers have indicated a severe cut-back in their requirements thereafter. It is obvious that blast-furnace operations are to be curtailed and that any shortfall in iron for the melting shops will be made good from the plentiful supplies of scrap at present available. A fairly substantial quantity of coking doubles is expected to be released and will be added to house coal stock.

The market for alternative domestic fuels is dull, except for anthracite stove nuts, but trade in industrial grades is up to average for the time of year. After intensive efforts to restore power station reserves the pressure is now eased and there is surplus duff and washed and untreated smalls available. Pearls are swelling undistributed stock, and there is also a small amount of singles for which no immediate market is available.

Fife and Lothians—Pits in the Lothians are closed this fortnight for the annual Edinburgh Trades Holiday, but adequate arrangements have been made to meet orders. The house coal position is very comfortable, despite a rise in sales owing to poor weather. The export position continues to disappoint.

African Mine Disaster Hearing Begins

AS a sequel to the disaster in Coalbrook North Colliery on January 21, 1960, when 436 miners lost their lives, the preparatory examination of an allegation of culpable homicide and of contravention of the Mines Act, began in Sasolburg, Orange Free State, on Tuesday.

Clydesdale Transvaal Collieries, represented by the manager of the Coalbrook North Mine, Mr. J. G. Ferguson, in his personal capacity, and Mr. H. Easingwood, underground manager, are appearing before Mr. J. J. Greyling the Vereeniging magistrate seconded for the hearing.

Coal Stocks Fall to 23,141,000 Tons

HOLIDAYS at the pits accounted for over 500,000 tons less coal output last week. Total production at 3,362,700 tons was down on both the previous week and the comparable week last year and it was nearly 400,000 tons below the average of 3,748,000 tons for the first 26 weeks of the year. It represents almost exactly, however, total consumption and exports for the week ended June 24—3,361,000 tons.

Instead of the fairly considerable increase in undistributed stocks expected at this time of year, both at collieries and open-cast sites, 52,000 tons were lifted, bringing the total down to 23,141,000 tons. Consumers' stocks, meanwhile, had risen by 436,000 tons to 14,582,000 tons and again the amounts held in reserve rose evenly over all sections of the trade, except in engineering and other metal trades.

There were 569,230 wage-earners on colliery books on June 24, against 599,920 on June 25, 1960, the numbers engaged at the coal face being 213,510 and 228,720 respectively. Total absenteeism (all workers) in the week ended June 24 was 14.92 per cent., compared with 14.34 per cent. in the week ended June 25, 1960. Output at the face was 4.145 tons and overall 1.444 tons in the week ended June 24, compared with 3.945 and 1.396 tons in the week ended June 25, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended July 1, and the tonnage lost through disputes:—

Division.	Week ended July 1, 1961.		Week ended July 2, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish	356,000	2,000	340,000
Northern (N&C) ..	194,000	49,000	216,000
Durham	335,000	134,000	461,000
North-Eastern ..	696,000	140,000	782,000
North-Western ..	188,000	54,000	171,000
East Midlands ..	731,000	165,000	828,000
West Midlands ..	273,000	—	279,000
South-Western ..	352,000	6,000	366,000
South-Eastern ..	26,000	1,000	32,000
Great Britain—			
Deep-mined coal ..	3,151,000	551,000	3,475,000
Open-cast coal ..	168,000	—	154,000
Other deep-mined (including licensed mines) ..	43,000	—	40,000
TOTAL ..	3,362,000	551,000	3,669,000

WATSON LAIDLAW & COMPANY, LIMITED—Mr. Douglas G. Lamont, production manager, has been appointed an additional director.

Board Changes

Deputy Managing Director of Edwin Danks

FIFTEEN years after joining Babcock & Wilcox, Limited, as a student apprentice, Mr. A. D. Thomson has been appointed deputy managing director of one of its subsidiaries, EDWIN DANKS & COMPANY (OLDBURY), LIMITED, makers of boilers, superheaters, stokers, etc.

Following a period of technical training at Paisley Technical College, Mr. Thomson graduated in 1949 with an external degree of B.Sc.(Hons.) in mechanical engineering from London University. In 1954-55 he was assistant to the manager of the Calorizing Corporation of Great Britain, Limited, a subsidiary of Babcock & Wilcox, and was later transferred to the special vessels department of the parent company. Since 1958 he has been head of the atomic energy commercial section of Babcock & Wilcox, being responsible for tendering on nuclear work and for the financial control of nuclear contracts.

WOODALL-DUCKHAM, LIMITED—Mr. D. Rider has retired from the board

PYROTENAX, LIMITED—Sir Mark Turner has become a member of the board.

WM. CORY & SON, LIMITED—Mr. W. A. King has been appointed a director.

PATENT SHAFT STEEL WORKS, LIMITED—Sir Donald Perrott has joined the board.

NIGHTINGALE ENGINEERING COMPANY—Mr. D. Boxall has been appointed a director.

ROLLASON WIRE COMPANY, LIMITED—Mr. W. L. Ross has been appointed managing director.

BERALT TIN & WOLFRAM, LIMITED—Mr. T. Muir Warden has been appointed a director.

SETTLE SPEAKMAN & COMPANY, LIMITED—Sir Lynden Macassey has resigned from the board.

G. A. HARVEY & COMPANY (LONDON), LIMITED—Mr. H. E. Cooper has retired from the board.

WRIGHTS' ROPES, LIMITED—Mr. E. P. Smith has been appointed deputy managing director.

TRIPLEX HOLDINGS, LIMITED—Mr. L. Steel is to succeed Sir Graham Cunningham as chairman.

PERKINS ENGINES, LIMITED—Mr. T. A. Read, secretary to the Perkins group, has been appointed to the board.

SANDERS & FORSTER, LIMITED—Mr. J. F. D. Wood has been appointed sales director of the company, a member of the Chamberlain Industries, Limited, group.

ASSOCIATED BRITISH ENGINEERING, LIMITED—Mr. W. A. Greenhill has been appointed a director, and Maj.-Gen. Sir Richard Lewis has resigned from the board.

SANDVIK STEEL BAND CONVEYORS, LIMITED—Mr. E. Bealing, formerly managing director, has been appointed chairman in succession to the late Mr. J. F. Sjogren.

H. J. ENTHOVEN & SONS—Mr. A. E. Speijer, general manager of N.V. Hollandsche Metallurgische Bedrijven, has been appointed a director in place of Mr. Andre Trebucq, who has resigned.

DORMAN, LONG & COMPANY, LIMITED—Mr. G. Foster and Mr. E. N. Highton have been appointed to the board. Mr. J. D. Bolckow has been appointed a special director. Mr. C. Hipwell has retired from the board.

PEGLERS, LIMITED—Mr. A. E. Emberton is resigning as chairman after 49 years with the company, and the board is to appoint Mr. J. Malcolm Harrison, vice-chairman, to succeed him. Mr. Harrison joined the board in 1954.

BIRMINGHAM BATTERY & METAL COMPANY, LIMITED—After 51 years' service with the company, Mr. Herbert W. Bennett has retired as sales director. Mr. Anthony W. Gibbins, deputy managing director, will be responsible for sales.

F. FRANCIS & SONS, LIMITED—On his retirement from business, Mr. B. E. Gunnell has relinquished his directorship of the company. He has also resigned from the boards of the subsidiaries, Keighley Lifts, Limited, and R.D.M. (Export), Limited.

MOUNTSTUART DRY DOCKS, LIMITED—After 50 years' service with the company, Sir Llewellyn T. G. Soulsby, chairman, has retired from the board, and has been succeeded as chairman by Sir G. Leighton Seagar. Mr. C. R. Cory has been appointed vice-chairman.

LAURENCE, SCOTT & ELECTROMOTORS, LIMITED—Mr. Justin H. Scott's appointment to the board renews the active participation of the Scott family in the management of the firm founded by his grandfather in 1883. His father, who died in 1942, was managing director.

HEYES & COMPANY, LIMITED—Ald. W. H. Bellis, who has been elected chairman of the board, has been associated with the company for more than 30 years. Mrs. M. H. Redmond continues as governing director, with Mr. R. S. Redmond as managing director and Mr. N. F. Brand as technical director.

CASTROL INDUSTRIAL, LIMITED—Mr. J. A. V. Watson will be appointed assistant managing director upon the retirement of Mr. W. F. List on January 1, 1962. Mr. Watson's appointment as an assistant managing director of the parent company Castrol, Limited, to take effect on the same date, has already been announced.

OTIS ELEVATOR COMPANY, LIMITED—Chairman and managing director, Mr. W. A. Frater, has relinquished the position of managing director and becomes chairman and chief executive officer. Mr. Charles F. Day, who has been associated with the company for over 30 years and a director since 1955, has been appointed managing director.

WELDING EQUIPMENT DIVISION FORMED BY ENGLISH ELECTRIC

WELDING business of the English Electric Company, Limited has been co-ordinated in a newly formed welding equipment division which has been set up at the company's Accrington works (telephone: Accrington 33241). The manager of the division will be Mr. R. H. Boughton, the chief engineer Mr. F. Mullery, and sales manager Mr. E. H. Ayres.

Mr. Boughton joined the company as a student apprentice in 1944 and since completing his apprenticeship has spent most of his time with welding sales. Mr. Mullery graduated in metallurgy from Birmingham University in 1949, and for the last five years has been head of the welding laboratory at the company's Whetstone works. Mr. Ayres joined the company in 1953, and for the last three years has been the company's chief technical welding representative for the Midlands and the South.

RAW STEEL PRODUCTION in the US during the week ended July 3 fell 2.7 per cent. to 1,925,000 (1,978,000) net tons. Production for the year to date at 45,071,000 (60,386,000) tons is 25.4 per cent. down.

Company News

HIGH TAXATION

Government Criticized by Company Chairman

SHARP criticism of the Government's taxation policy was made by Mr. M. A. T. Johnson, chairman of Richard Johnson & Nephew, Limited, iron, steel, copper, and aluminium wire drawers and rollers, etc., of Manchester, in his review of the past year presented at the annual meeting last Friday. In the wire industry, he said there were always new requirements which demanded new techniques. There was constant expenditure on new plant and investment allowances were insufficient. The present unexpectedly high rate of taxation deprived the company of funds on which it depended to maintain efficiency to expand in export markets.

Mr. Johnson reminded shareholders that when in Opposition the Conservatives had attacked the introduction of profits tax, particularly on undistributed profits. Nevertheless, profits tax on undistributed profits had been increased four times in the last five years. The Budget proposals brought industrial taxation up to 53¼ per cent., and if the weekly tax on employees was enforced that rate would be even higher, while the tax on fuel oil would increase costs further.

Listing other increasing costs, Mr. Johnson said this ever-rising expenditure affected in varying degrees all productive industry, at a time when Britain's relationship with Europe lay in the balance and must give much satisfaction to foreign competitors.

The trading profit for the year at £1,895,103 fell short of last year's record by a little over £300,000 and was due to a number of factors. The year was the most uneven that he, the chairman, could recall. "When the demand changes sharply —on five occasions—in the course of a year, owing to artificially imposed conditions, it is difficult to organize production economically." The company had spent well over £1,000,000 on new plant in the past two years.

S. RUSSELL & SONS, LIMITED, mechanical and structural engineers, of Leicester—Acceptances have been received for about 99 per cent. of the 374,000 ordinary 5s. shares offered to shareholders by way of rights at 6s. a share.

MARRYAT & SCOTT (HOLDINGS), LIMITED, lift manufacturers etc., of Hounslow (Middx)—Profit after tax for the year ended March 31, 1961, increased to £123,687 (£107,327) and dividend is raised to 32½ (27½) per cent.

RENOLD CHAINS, LIMITED, precision chain engineers, etc., of Manchester—Final dividend of 7 per cent. for the year to March 31, 1961, maintains the previous year's 10 per cent. equivalent. Group profit increased to £2,152,780 (£1,824,248), and the net balance attributable to the company, after tax and minority interests, is £1,019,418 (£926,809).

MORGAN CRUCIBLE COMPANY, LIMITED—Consequent upon the reorganization of the parent into a holding company the directors propose that the accounts of all the companies in the group shall in future be made up to the end of December. In the year ended April 2, 1961, group profit, before tax, was £2,235,815 (£2,043,417). Total sales rose by 9 per cent. compared with 17½ per cent. in the previous year.

WESTON-EVANS (HOLDINGS), LIMITED—With the recommendation of a final of 20 per cent., total payment for the year ended March 31, 1961, is being raised to 30 (20) per cent. Group profit increased to £111,180 (£71,719), after tax of £86,243 (£57,531).

HILLS (WEST BROMWICH), LIMITED, manufacturers and engineers to the building trades—The company reports a profit of £50,294 for the 17 months to December 31, 1960, against a loss of £28,621 for the previous year. There is no ordinary dividend as before.

BIRMINGHAM RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—Dividend on the £100,000 6 per cent. cumulative preference capital, due in August, is being deferred. There was no dividend on the £990,975 ordinary for 1960 when a group loss of £255,151 was incurred.

DRAKE & GORMAN, LIMITED, electrical, mechanical and hydraulic engineers, of London, S.W.1—Group profits for the year to March 31, 1961, have risen to £171,154 (£129,467) and a 15 per cent. dividend, plus a 2½ per cent. bonus, on capital doubled by last November's rights issue, is being paid.

PARKINSON COWAN, LIMITED, London, S.W.1—Net profit for the 15 months ended March 31, 1961, fell to £47,648 (£281,184) after tax of £5,704 (£269,374). A final dividend of 6½ per cent. makes 11½ for the period, compared with the 17½ per cent. total distribution, including 2½ per cent. bonus, paid for the previous year. The company is engaged in negotiations to widen the base of its operation in the industrial heating field.

MIDLAND TAR DISTILLERS, LIMITED, Oldbury (Worcs)—In his statement on the year to March 31, 1961, the chairman, Mr. R. B. Robinson, says that projects in hand have committed the company to capital expenditure of £500,000, which is not likely to yield a full year's benefit until 1963/64. Despite the lower profit, the directors propose to repeat last year's distribution of 12½ per cent. on ordinary capital.

BLACKWOOD HODGE, LIMITED—Dividend for the year ended October 31, 1960, is being maintained at 6 per cent., despite the lower net profit of £16,730 (£241,944). Tax accounted for £140,079 (£330,300). The chairman, Mr. Bernard Sunley, states in his annual review that there may be factors accounting for the decline in profits, but in the main it was attributable to ex-

ceptional stock losses, principally in Canada, and bad debts, mainly in Canada and Belgium.

SADLER & COMPANY, LIMITED, GROUP—While the year's trading has resulted in a modest profit, the board does not feel justified in recommending a final dividend for the year to December 1, 1960. Total payment therefore, remains at the interim figure of 2½ per cent. Mr. G. H. C. Sprot, the chairman, points out that increased competition has meant a cut in profit margins and that lack of crude tar has reduced working at many plants to little more than 50 per cent. of rated capacity.

PYROTENAX, LIMITED, electric cable manufacturers, of Hebburn (Co. Durham)—With a bonus payment of 5 per cent. for the year to March 31, 1961, the company's silver jubilee year, it announces a one-for-three scrip issue proposal. An unchanged final dividend of 25 per cent. brings the total distribution to 45 (40) per cent. Net profit is £428,506 (£430,894) after tax of £442,928 (£425,955). The proposed scrip issue is on the basis of one ordinary or "A" ordinary share for each 15s. of such capital held.

BARROW BARNSLEY (HOLDINGS), LIMITED—Dividend for the year to April 30, 1961, is being raised to 9½ (9) per cent. The second interim, in lieu of a final, is 4½ per cent. An interim of 3½ per cent. and a bonus of 1½ per cent. have already been paid. Last January the capital was raised to £1,998,024 by the issue of 2,664,032 ordinary shares of 5s. to Wombwell Coke & By-Products Company, Limited, against the acquisition of the one third balance of shares not already held in Barnsley District Coking Company, Limited.

RELIANCE-CLIFTON CABLES & INDUSTRIAL PRODUCTS, LIMITED—Sir Robert Renwick, chairman, said at Wednesday's meeting in London that there was little sign of any real improvement in prices. The price war was over, but it was evident the industry would not be returning to former conditions and that cable-making was going to remain a highly competitive business. There were difficult times ahead, except for efficient producers, but the future could be faced with "reasoned confidence."

VILLIERS ENGINEERING COMPANY, LIMITED, manufacturers of motor cycle and industrial petrol engines, ferrous and non-ferrous castings, etc., of Wolverhampton (Staffs)—In his interim report, the chairman says that for the first eight months of the current year there was a fall of 25 per cent. in the turnover of the group compared with the corresponding period last year and the monthly turnover has not yet recovered to a satisfactory level. Consequently, the results for the full year cannot be expected to show a profit.

WHESSOE, LIMITED, designers and builders of plant for oil, atomic power, gas and chemical industries, of Darlington (Co. Durham)—With intense competition persisting at home and abroad, the majority of orders still have to be taken with a very bare margin and it must be expected that for the time being profits will continue to decline, says the chairman, Mr. C. M. Spielman. It is expected, however, that when the full benefits of the reorganization and expansion policy are realized, there will be a resumption of the upward trend.

HATTERSLEY (ORMSKIRK) LIMITED, engineers, iron and non-ferrous founders, of Ormskirk (Lancs)—With a good order-book and given freedom from political or industrial strife, Mr. H. C. Nicholson, the chairman, hopes for improved results in the current year. Despite teething troubles of the new mechanized foundry and a scarcity of labour, both of which are being overcome, deliveries last year rose by 16 per cent. Selling prices had to be increased in view of increased costs, Mr. Nicholson says, but not to the extent which would have been necessary to maintain profit margins previously enjoyed. Direct export sales also increased.

DELTA METAL COMPANY, LIMITED—The offer for Davis & Timmins, Limited, manufacturers of automatic screw machine products, of London, E.17, has now been extended to the preference shares in the event of the offer for the ordinary shares becoming unconditional. The basis of the offer would be six 6 per cent. cumulative £1 preference shares in Delta for every five 6½ per cent. cumulative preference shares in Davis & Timmins. The board of the latter company considers this basis of exchange a fair one which can be recommended for acceptance if and when received.

RHODESIAN IRON & STEEL COMPANY, LIMITED—Mr. W. E. Geerling, chairman of the company, in which the Lancashire Steel Corporation, Limited, has a financial interest, reports a loss of £142,000 sterling in 1960. The loss is after provision of £391,000 for depreciation and accrued but unpaid interest on the Southern Government's second debenture stock. The accumulated loss now totals £300,000. In terms of the agreement signed when the company was taken over from the Government by private enterprise four years ago, the Government's unpaid interest is converted into additional second debenture stock at par.

Davy-Ashmore Profits Exceed £4,000,000

CONSOLIDATED profits of Davy-Ashmore, Limited, formed by the merger between Davy-United, Limited, and the Power Gas Corporation, Limited, amounted to £4,082,129, subject to tax and outside interest, for the year ended March 21, 1961. The figure includes the profits of the former Power Gas group as from April 1, 1960. A final dividend of 17½ per cent. makes 27½ per cent.

The profit, subject to tax, of the former Davy group for the year to March 31, 1960, was £2,355,603, and that of the former Power Gas group for the year to September 30, 1959, subject to tax and outside interests, was £1,581,363, making an aggregate of £3,936,966.

After charges of £891,755, including £614,209 for depreciation, the trading balance is £3,990,745. Investment income of £231,384 is added and interest of £140,000 deducted, leaving £4,082,129 as stated. Tax takes £1,963,237, and deducting £3,003 outside interests, there is £2,115,889 attributable to the parent company.

It is proposed to split the existing £1 units into 5s. Ordinary shares.

Edgar Allen Fails to Maintain Profits Increase

GROUP net profits of Edgar Allen & Company, Limited, steel manufacturers, engineers, and founders, of Sheffield, for the year ended April 1, 1961, totalled £251,669 against £271,043, after tax of £241,187 (£235,324). The company, which increased its interim dividend by 1 per cent. is repeating the final at 8½ per cent. to make 13½ (12½) per cent. for the year.

The directors state that the sales turnover of both the parent company and of the subsidiary companies, in aggregate, slightly exceeded in value that of the previous year, but the increase in the group net profits, mentioned in the interim report, over the results for the first six months ended September 30 of the preceding year was not maintained.

Law Cases

NEW BOLT AND NUT PACT

Decision Reserved on Injunction Application

JUDGMENT was reserved in the Restrictive Practices Court on an application on behalf of the Registrar for a declaration concerning a price agreement which members of the Black Bolt and Nut Association of Great Britain intended to enter into. Mr. A. Bagnall, QC, for the Registrar, submitted that the agreement was "of like effect" to an agreement previously before the Court in respect of one of the restrictions which was declared to be contrary to the public interest.

Mr. Bagnall said that the Court in its judgment upheld the standard price-fixing restrictions because they avoided the need for "shopping" in a case where the expense and trouble of "shopping" was considerable. The Court condemned a restriction as to aggregated rebates and a restriction that the minimum price for Government departments, harbour boards, and other large users should not be below the price circulated by the secretary as the lowest price.

All members interested in supplying Government departments reported their proposed price to the secretary and the secretary circulated the lowest reported price as the minimum price. Following on the judgment, the association had undertaken not to enforce or give effect to the restrictions that had been condemned or make any agreement to the like effect without giving notice to the Registrar.

Pricing Method

Mr. Bagnall said the association proposed to make a new agreement whereby the prices to be charged to Government departments would be the same as the standard prices, except in cases where there were abnormal savings in costs of production because of the nature or size of the order. The Registrar, he said, sought a declaration that the proposed agreement would be "to the like effect" as the restrictions relating to Government departments in the original agreement, and an injunction restraining the association or its members from making the proposed agreement.

He submitted that any price fixing agreement was to the like effect of another price-fixing agreement where it operated in respect of substantially the same persons or classes of persons as the old agreement. The evidence in the case was that the minimum prices under the reporting procedure were generally the same as the standard prices, and the effect of the old agreement was to confine members to the standard prices when tendering to Government departments. The effect of the new agreement would also be to confine them to the standard prices.

Mr. B. MacKenna, for the association, submitted that the new agreement did not contain the same or substantially the same restrictions as the old because there were three notable differences between them. The new agreement treated all buyers in the same way, for what determined price under it was the nature of the order and not, as in the old agreement, the character of the buyer. The new agreement passed on to all buyers any special cost savings in abnormal cases, and the fixed price was now a maximum price as well as a minimum price.

There was nothing in the new agreement to show that it was other than in harmony with two important principles stated by the Court in its judgment: that prices for all buyers should be related to costs, and that there should be no price concession to large buyers as compared to small buyers. The new agreement treated all the buyers in the same way, and since the standard prices were reasonable and based on costings, there was no reason why the new agreement should be condemned.

Mr. Justice Diplock said that judgment would be given before July 31 .

Injured Miner Awarded £15,000 Damages

DAMAGES of £15,000 were awarded at Nottinghamshire Assizes to a miner who was struck in the back by a large piece of stone during blasting operations at Blidworth Colliery (Notts) in 1958, as a result of which he was stated to have been crippled for life. The man, Mr. John Edward Roberts (42), claimed damages from the National Coal Board and from his employers, ERCO (Mining Developments), Limited, who were carrying out contract work for the NCB on a new underground road.

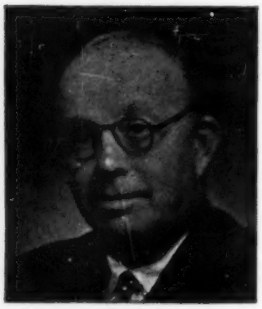
Mr. Graham Swanwick, QC, said Roberts was struck in the back by a piece of stone 4 ft. by 3 ft. by 9 in., which fell from the face of the heading that was being driven. Blasting had not removed the whole of the face, and had left a step of stone, preventing the erection of a supporting girder. Roberts and another man attacked this stone with a pneumatic pick. He worked for about an hour, and the new face had been exposed for about three and a half hours when the piece of stone fell from the face and struck him.

Damages had been agreed at £18,500. After Mr. Roberts had given his evidence, there was an adjournment, after which Mr. Swanwick said the case had been settled and damages of £15,000 agreed.

JOHN LEWIS THOMAS (59), employed at Penallta Colliery, Hengoed (Mon), was fined £5, with £2 2s. costs, for falling asleep in the pit's underground pumproom.

Advice on Setting Up Oversea Factories

COMPANIES planning to set up oversea factories in the struggle to break into new markets are offered some succinct and practical advice by Mr. John Oldham, chairman of Oldham & Son, Limited, battery, and miners safety lamps and equipment manufacturers, of Denton (Lancs), in a letter to the Financial Times.



MR. JOHN OLDHAM

Mr. Oldham urges, in the first instance, a thorough preliminary research into the markets on which the company is proposing to embark, and goes on: "Whenever possible, in planning for manufacture in oversea countries, it is desirable to have a basic product on which to base a development programme. It will act as a springboard, from which manufacturing can be steadily developed." He emphasizes the necessity for "identifying oneself completely" with the country in which the factory is to be set up. "It is no use settling down in another country and trying to run the business entirely by British rules, one must adapt one's own ideas, and ways of living and working, to those of the country in which it is intended to operate."

The key men, on whom the success of a new company will depend, must be handpicked with the greatest care, says Mr. Oldham, who adds that he regards executives of the right type as one of the nation's most valuable invisible exports. Success in oversea markets, he reminds, is not merely a matter of "mopping up" or of salesmanship and nothing else. "It is a two-way traffic, and the newcomer must be prepared to invest time and effort, as well as money—you cannot just buy your way in."

Above all, he concludes, no written contact can equal personal contact, and top executives from the parent company—from chairman level down—must be prepared to make regular visits for contact, investigation, and goodwill.

Speaking to over 1,000 employees of Oldham & Son at their annual outing to Blackpool last Saturday, Mr. Oldham said that today the company was "ahead by 14 years" of the Government's exhortation for more and more firms to export and where necessary to instal manufacturing plants oversea. Targets had been set for the next 12 months which would still further increase output and diversify production, he added.

TENABLE AT A UK university for post-graduate studies in production engineering, a bursary of £600 per annum is to replace the Schofield Travel Scholarship, announces the Institution of Production Engineers. The bursary, which includes fees, will be tenable for the first time for September-October, 1962, entrants. Applicants are required to hold a first degree in engineering or a diploma in technology (Eng): have fully discussed their proposed course or work with the university of their choice: and have been accepted by the university. Further details will be published later in the year.

NCB Contracts Out of State Pension Scheme

IT is revealed in the annual report of the Mineworkers' Pension Scheme for 1960-61, that the National Coal Board has contracted its entire labour force out of the State Graduated Pension Scheme. The board decided on this step after consultations with the National Union of Mineworkers and other interested unions.

Membership of the Mineworkers' scheme is thus compulsory and requires contributions of 2s. 3d. a week from new entrants plus 2s. 9d. a week from the employer. The scheme provides a minimum pension of £1 a week, subject to 10 years' service, and also incapacity retirement pensions. There are now 590,600 members.

During the year members' contributions amounted to £2,027,503, and NCB contributions were £6,759,742. Investment income of the Fund rose to £3,250,174, compared with £2,755,391 last year. The fund now stands at £57,000,000.

Annual reports of the Industrial Injuries Supplementary Benefits and Special Fatal Accidents Schemes for 1960, published at the same time, show that at the end of 1960 the fund of the Supplementary Scheme was £14,000,000 and benefits paid in the year were £3,412,969.

The lump sum paid under the Special Fatal Accident Scheme for deaths resulting from accidents, or from natural causes at the pits, amounted to £103,307. The report notes with pleasure the substantially smaller number of deaths and decrease in the cost of benefits compared with 1959, despite the disaster at Six Bells Colliery, which resulted in 44 deaths involving the payment of benefit amounting to £10,033.

Present market value of miners' funds is £62,000,000 against a book value of £44,700,000 due to the fact that ordinary stocks are worth well over double their book value.

Electronic Weighing Machine Sales to Europe Rise

INCREASED sales of its scales and electronic weighing devices to Europe in recent months, despite growing import barriers and lower price structures, is reported by Fairbanks, Morse & Company, Limited, largest manufacturing subsidiary of the Fairbanks Whitney Corporation. Recent orders for the company's heavy-duty industrial scales and electronic weighing systems have come from the steel industries of Britain and France.

Commenting on the increased business now coming from Europe, Mr. George E. Millar, general manager of the company's international division, said the company found that quick deliveries gave it a marked advantage over local suppliers.

LATEST ORDER for 1,000 4-wheeled steel covered wagons, which Metropolitan-Cammell Carriage & Wagon Company, Limited, has secured from Pakistan Eastern Railways, is the seventh wagon order won by the company in the last 10 years and brings the total of wagons supplied to Pakistan to nearly 5,000. A spokesman for the company said that owing to severe international competition in this field, no value for the contract could be given.

Continuous performance!

continuous cast rods and tubes

CUT COSTS FOR PHOSPHOR-BRONZE BUSHES AND BEARINGS

Continuous cast phosphor-bronze rods and tubes by the 'BIRSO' technique offer considerable advantages in cost and superior physical properties.

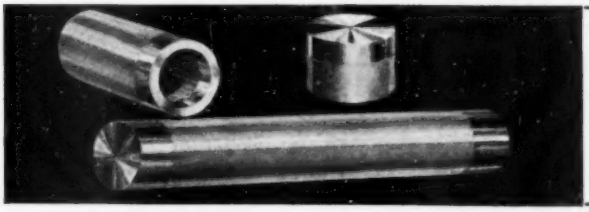
Since the rods and tubes are supplied in exact lengths up to 12ft. there is negligible waste of bar ends.

- No sand core used. • Porosity is entirely eliminated.
- Greater impact strength, tensile strength, yield stress hardness and better fatigue characteristics, and improved uniformity.

BIRSO TRADE MARK BN

PHONE OR WRITE
for complete specifications of our continuous cast phosphor-bronze rods and tubes together with details of our precision machined bushes and bearings in any quantity.

NON-FERROUS AND HIGH DUTY IRON CASTINGS
FROM A FEW OUNCES TO 10 TONS IN QUANTITY OR ONE-OFF SPECIALS!



CONTINUOUS CAST PHOSPHOR-BRONZE RODS AND TUBES

Round Solid Rod
from ½in dia. to 2½in dia.

Round Cored Rod
from 1in o.d. x ½in i.d.
to 2½in o.d. x 2in i.d.

Minimum wall thickness ¼". All in 12 ft. lengths

T. M. BIRKETT, BILLINGTON & NEWTON, LTD

HANLEY AND LONGPORT · STOKE-ON-TRENT · ENGLAND

Hanley, Phone: Stoke-on-Trent 22184/5/6/7. *Longport, Phone:* Newcastle, Staffs 51433/4.

Expansion By Belgian Steel Industry

PRODUCTION capacity of Belgium's ferrous metal manufacturers could rise to 10,500,000 metric tons a year by 1965, according to the annual report of the Belgian iron and steel industry association, Groupment des Hauts-Fourneaux et Aciéries. This would be dependent on a continuation of the current high investment rate, which rose from 4,100,000,000 fcs. in 1959 to 7,000,000,000 fcs. last year. The estimate for 1965, which does not take into account such projects as the new Ghent steelworks, compares with a 1960 output of 7,081,000 tons of raw steel—itself 11 per cent. above the total for the previous year.

Full details have now been released from the Luxembourg headquarters of the Arbed steel company about the new Belgian steelworks complex planned for the Ghent area. This will be situated near Selsate on the Belgian-Dutch border, to the north of Ghent and on the canal leading to Terneuzen on the mouth of the Schelde. Production will begin in 1964 at an annual rate of 1,500,000 tons of raw steel.

The plant will be operated by Sidemar, a company to be set up with an initial capital of 5,000,000,000 fcs. and 9,000,000,000 fcs. by 1964. Arbed will hold 33 per cent. of the initial capital. Other shareholders in the operating company are the Belgian steel company Cockerill-Ougrée, the Franco-Belgian Providence steel group, the Schneider group of France, the Société Générale Belgique, Confinindus and a French banking house.

Increased British Trade with East Germany

BRITAIN'S trade with East Germany increased by £1,438,418 in the first five months of 1961 to £8,004,492, compared with a total of £6,566,074 for the same period in 1960, according to figures published by the Board of Trade. The 1961 figure represents an increase of £4,582,501, compared with the total of £3,421,991 for the first five months of 1959.

Exports and re-exports to East Germany for the five months ending May 31, 1961, at £4,603,099 show a substantial rise on the figure of £3,722,482 for the similar period of 1960, and are nearly three times the 1959 five months period, which totalled £1,538,133.

Imports from East Germany at May 31, 1961, totalled £3,401,393, compared with £2,843,592 and £1,882,858 for the similar periods of 1960 and 1959.

The rise in British exports to East Germany was particularly marked in non-ferrous base metals, exports of which were valued at £790,352 for the first three months of 1961, compared with £268,317 for the first three months of 1960. A substantial increase was also shown by machinery (other than electric), which rose to £434,296 (£228,520); and scientific instruments, etc., £60,743 (£23,976).

IN THE FIRST five months of this year total sales of tractors by the tractor group of the Ford Motor Company, Limited, reached 34,600, an increase of nearly 6 per cent. over the same period of 1960. Mr. W. B. Batty, general manager, says that home market sales during May were 2,358 (1,523), a 55 per cent. increase on last year and the best for that month for many years.

Dorman Long Board Changes

CHANGES in the directorate of Dorman, Long & Company, Limited, were announced. Mr. G. E. Chicken, commercial manager of Dorman Long (Steel), Limited, and Mr. C. Hipwell, general manager of Redpath Brown & Company, Limited, retired last Friday from their executive positions on the board of Dorman Long, the former continuing as a non-executive director and Mr. Hipwell remaining a director of Redpath Brown. Mr. Hipwell, who was with Dorman Long from 1913 until his appointment to Redpath Brown in 1945, was erection superintendent for the building of the Sydney Harbour bridge.

Mr. George Foster, general manager production, and Mr. Ernest N. Highton, general sales manager of Dorman Long (Steel), both of whom became special directors of the parent company in 1959, now become executive directors. Mr. J. D. Bolckow, who succeeds Mr. Hipwell as general manager of Redpath Brown, is appointed a special director of Dorman Long.

Steelworks Plan for Brazil

GOVERNMENT commission in Brazil has recommended the building of a new steelworks in the country with an initial capacity of 350,000 metric tons of raw steel a year, rising to 1,000,000 tons annually. The plant would be situated in the newly-formed Brazilian State of Guanabara. The steelworks would use high-quality iron ores from the Minas Gerais area of Brazil, and water and electrical energy from Santa Cruz, while it would be possible to lay a rail connection to the ore-rich Paraopeba Valley and erect a new coal and ore port on the State's coast.

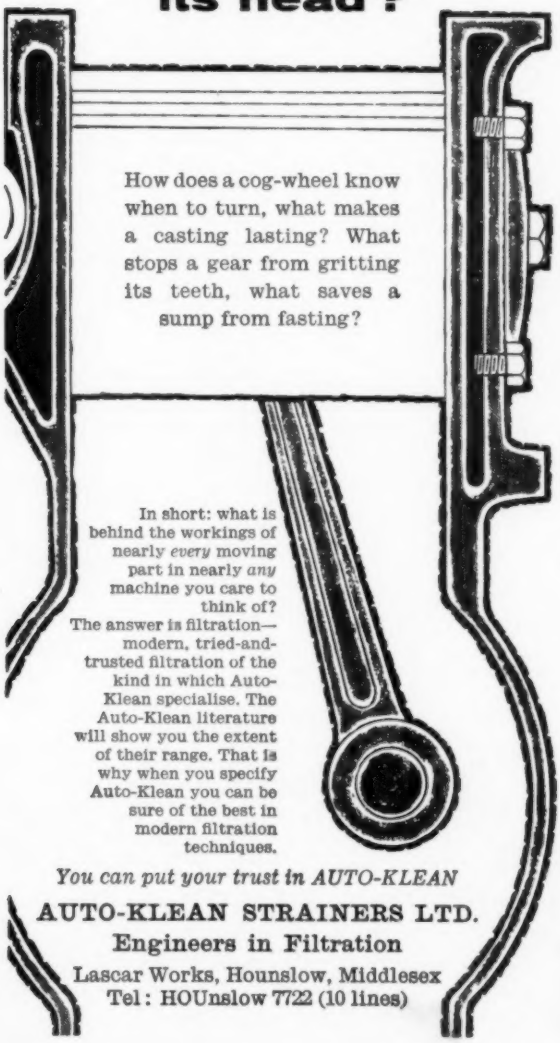
The new plant could be in production within three to four years, it is stated. Its financing would require the sum of 7,000,000,000 to 8,000,000,000 cruzeiros for site work and work elsewhere in Brazil connected with the plant's erection, as well as about US $15,000,000 for the purchase of plant and equipment abroad. The plant's production programme would be centred on special steels. The plan is at present before the Brazilian National Economic Council.

OPERATIONS START AT NEW RHODESIAN ORE MINE

MINING operations have begun at the Alaska mine near Sinoia, Rhodesia, belonging to the Messina (Transvaal) Development Company, Limited, reports Barclays Bank D.C.O. Ore is being won by open-cast quarrying, although underground mining will be carried out at a later date. Concentrates from the mine will be processed at the Alaska smelter of an associated company, Messina Rhodesian Smelting & Refining Company, Limited.

Preliminary talks, the Bank adds, have been held regarding possible development of the Buckwa iron-ore deposits and the establishment of a pig-iron plant. Rhodesia railways has also received inquiries regarding the possible transport of quantities of iron-ore ranging from 20,000 to 500,000 tons a year, mostly as a result of Japanese interest.

What saves a cylinder from losing its head?



How does a cog-wheel know when to turn, what makes a casting lasting? What stops a gear from gritting its teeth, what saves a sump from fasting?

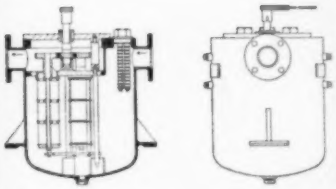
In short: what is behind the workings of nearly *every* moving part in nearly *any* machine you care to think of? The answer is filtration—modern, tried-and-trusted filtration of the kind in which Auto-Klean specialise. The Auto-Klean literature will show you the extent of their range. That is why when you specify Auto-Klean you can be sure of the best in modern filtration techniques.

You can put your trust in AUTO-KLEAN

AUTO-KLEAN STRAINERS LTD.
Engineers in Filtration
Lascar Works, Hounslow, Middlesex
Tel: HOUnslow 7722 (10 lines)

The 30M4 is specially recommended for all grades of oils. It can also be used, however, for distillates, water, chemicals, beverages, paints, resins, pulp and industrial liquids of every kind.
Principle: Edge-filtration using four all metal plate-type filters. Three magnetic filters on the inlet side give added protection against micronic ferrous particles

. . . This AUTO-KLEAN 30M4 self-cleaning filter



Advantages: (1) Full flow filtration. *All* the liquid passes through the filters to the *clean* side of the system. (2) Low pressure loss, ensuring high efficiency. (3) Self cleaning without dismantling or interrupting the flow. Two turns of the handle are all that is necessary. (4) Long life—lasts the life of the engine or plant. (5) Saves space and weight—large capacities relative to size.
Data: Handles up to 11,000 gallons per hour of lubricating oil in a defined mesh of 0.003". Defined meshes range from 0.0015" to 0.008". Maximum working pressure 50 p.s.i. Steam jacketed designs for high temperatures are available.

Full details sent on request

A range of filters is also available for varying applications and flows up to 150,000 gallons per hour.

News in Brief

FROM JULY 22 the address of John Miles & Partners (London), Limited, consulting engineers, will be Moor House, London Wall, London, E.C.2 (telephone: METropolitan 0471).

FINAL Ministry of Labour figures for mid-June confirm that there was a general drop in unemployment in most industries and services. There was a reduction of 11,900 in manufacturing industries.

E. GREEN & SON, LIMITED, Wakefield, has been appointed sole licencees in the UK for the manufacture of sinter fans and Schicht axial blowers, designed by Kuhnle, Kopp & Khusch, Frankenthal.

NEARLY 200 engineering workers in the plant department of the Glacier Metal Company, Limited, at Kilmarnock, who went on strike last week over a wage claim, returned to work on Monday.

MORE THAN 3,600 years of service at Guest, Keen & Nettlefolds, Limited, were represented by 115 people who received long-service awards on Monday. Twenty-one had served for 45 years and 32 for 35 years.

THE FORMATION of a Civil Engineering Research Council was announced in London on Wednesday. Its basic objects will be the collection of funds to promote research into new civil engineering techniques and the application of research to industry.

NEW REGIONAL office has been established by the High Voltage Engineering Corporation, Burlington (Mass), at 635, S. LaGrance Road, LaGrange (Ill), to serve expanding midwestern markets for nuclear particle accelerators used in radiation research and industrial processing.

MR. H. S. ATTER, London and Home Counties representative, for Marco Conveyor & Engineering Company, Limited, is now acting in a similar capacity throughout England and Wales. He will operate from head office in London. The representation in Scotland is not affected.

TWENTY-FOUR civil engineering scholarships have been awarded this year by the Civil Engineering Scholarship Trust, compared with 18 last year. The scholarships will enable the boys concerned to begin this autumn a three-year university course for a civil engineering degree.

GOLD WATCHES were presented on Tuesday to two more employees of James Neill & Company (Sheffield), Limited, steel manufacturers, after 25 years' service with the company. This brought the total of watches awarded by the firm to 123, and 103 of the recipients are still with the company.

BUENOS AIRES concern, Fast S.A. Commercial e Industrial, is to produce under licence 3-cylinder, 4-cylinder and 6-cylinder Perkins diesel engines. A new plant in the Argentine will cost about £1,000,000 and will produce about 12,000 power units a year for vehicles and agricultural machinery.

LIBERIAN ore carrier Ore Regent is due at Ore Quay, Tyne Dock on Sunday with a 35,526-ton cargo of iron ore from Puerto Ordaz—a new record both for the Tyne and the UK. The previous record cargo was one of 34,520 tons discharged at the same quay in April by her sister ship the Ore Jupiter.

SHEFFIELD MAKERS of basic refractories, Pickford, Holland & Company, Limited, has entered into an agreement with E. J. Lavino & Company, Philadelphia, US, for the manufacture in Britain of Lavino Ferrobond CMX basic roof brick which is being used extensively by North American open-hearth steelworks.

NEW SUBSIDIARY, Steelfab (France) SA, 72, Avenue J. J. Rousseau, Houilles, (S.O.), France, has been established by Steel Fabricators (Cardiff), Limited, (a member of the Adamant & Western group), as a manufacturing and sales company to meet the increasing demand for agricultural and industrial equipment in France.

AS A RESULT of an agreement between Associated Electrical Industries, Limited and Facit Electronics AB of Sweden, the electronic apparatus division of AEI has been appointed sole agents in the UK and British Commonwealth (except Canada) for the Facit Carousel memory, high speed tape punch and high speed reader.

PRESENTATIONS WERE made on Monday to eight employees of Steetley Company, Limited, to mark their 50 years' service with the group. Presentations were also made to two retiring members, Mr. T. B. Stocks, brother of Mr. W. Stocks, managing director of the dolomite division, and Mr. F. W. Dresser. Both had over 40 years' service.

NEW FACTORY at Drogheda (Co. Louth) for the conversion of peat into Berkoal, a substance widely used in foundries in the manufacture of castings, was opened by the Eire Minister of Transport and Power, Mr. Erskine Childers, on Wednesday. The plant will within a few months have a capacity of 12,000 tons a year, of which about 95 per cent. will be exported.

Department of Automation Urged for Britain

SUGGESTION that a Department of Automation should be set up, organized on a national basis and be representative of trade unions, management, and the Government, for dealing with the problems of automation in British industry, was made at the Harrogate conference on automation by Mr. L. L. Goodman, of the Electrical Development Association. The idea was put forward during a discussion after a paper by Mr. W. J. Carron, president of the Amalgamated Engineering Union, on the effects of automation on industrial relations from the trade union angle.

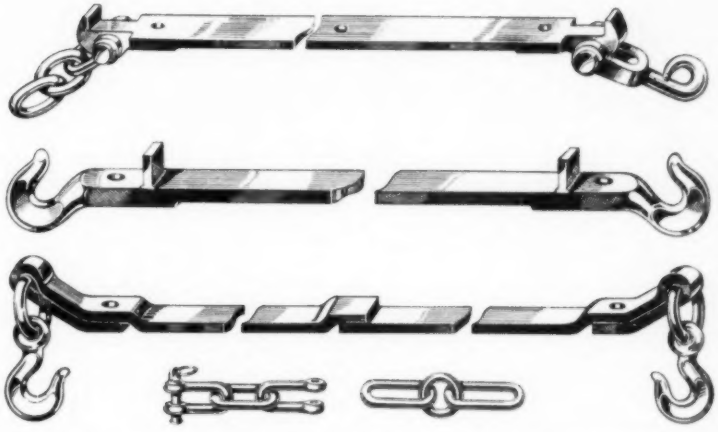
Mr. Goodman said that the United States had recently set up such a department. This kind of organization could help, for instance, by making a study of different occupations to find out how men redundant in one industry could be moved to where much the same skills were required. This would do much to alleviate the workers' fears of redundancy by increasing mobility. Considerable trouble would arise, he felt, without some form of national planning, and he pointed out that redundancy would affect management as well as labour.

Sir Walter Puckey, chairman of the conference, who is a director of International Computors & Tabulators, Limited, and other companies, summing up on the subjects of automation, men and money, said that wage structures in Britain were out of date but "whenever we decide to get rid of them, objections are raised by somebody." He said he was depressed that many companies and unions had apparently so many problems that there was no time for making a basically new approach to payment structures.

Regarding the question: "Will automation bring redundancy?", he said he had found no such evidence, and in practice automation, far from creating redundancy, had created jobs even in clerical occupations where the relieving of people had been expected.

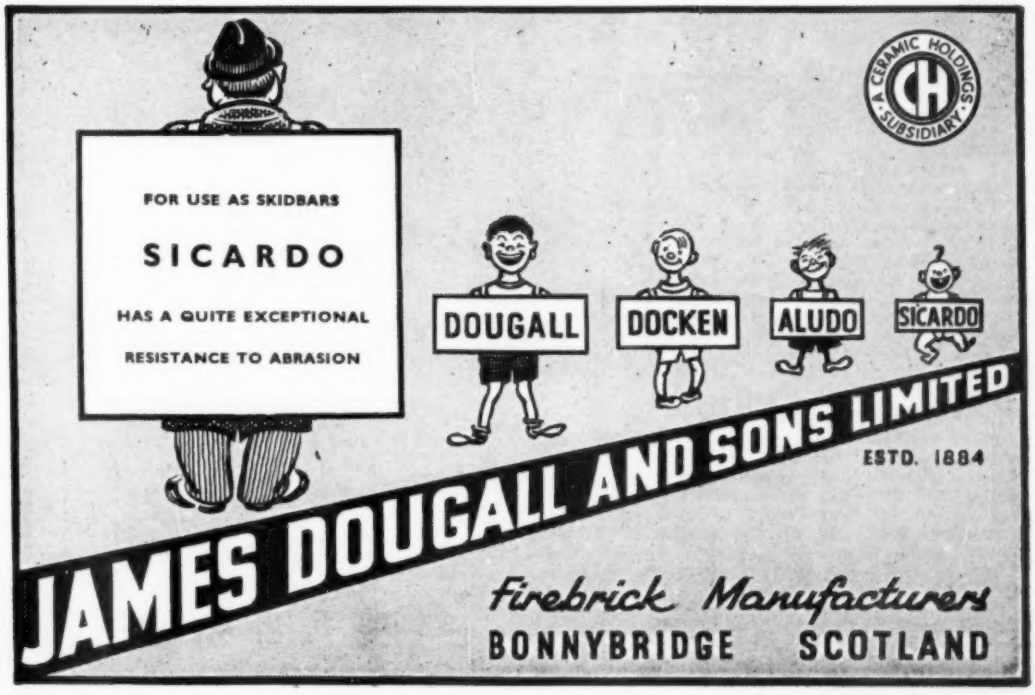
The conference, which ended last Saturday, was under the auspices of the British Conference on Automation and Computation. It was organized by the British Institute of Management.

DRAWBARS & COUPLINGS



TIMOTHY PARKES & SONS LTD

P.O. Box 20, OLD HILL, STAFFS. Phone : CRADLEY HEATH 66566



CURRENT PRICES OF IRON AND STEEL

July 6, 1961

(Basic prices, delivered unless otherwise stated. In accordance with Iron and Steel Board Price Determination, 1961, No. 2, the price of products listed below coming under the board's control are increased by 1 per cent.)

PIG-IRON

Foundry and Forge Iron.—No. 3 iron, Class 2, Middlesbrough, £21 17s.; Birmingham, £21 9s. 3d., 10-ton lots or over.

***Low-phosphorus Iron.**—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

***Basic Pig-iron.**—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

Hematite.—Si less than 2%, S & P 0·03-0·05%, 10-ton lots or over; N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s.; Birmingham, £25 13s.; Wales (Welsh iron), £23 19s.

Refined.—Cylinder and refined irons, South Zone, £25 9s., North Zone, £25 6s. 6d. Refined malleable, max. 0·10% P, South Zone £26 9s., North Zone £26 6s. 6d.

MANUFACTURED IRON

(*Bar basis, 2⅝ in. to ¾ in.*)

CROWN IRON: England and Wales (Zone 1), £51 12s. 6d.; Scotland, £51 7s. 6d.; Ireland, f.o.q. Belfast, £54 12s. 6d., all other Northern Ireland ports, £55 12s. 6d., f.o.q. Cable iron, £1 extra.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 100 tons and over, £32 5s. 6d.; hard (0·41-0·60% C), 50 tons and over, £33 17s.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting steel up to 0·25% C, 50 tons and over, £35 4s. 6d. SIEMENS-MARTIN ACID (50 tons and over): Up to 0·25% C, £40 11s.; silico-manganese, £43 4s.

Billets, Blooms, and Slabs for Forging and Stamping.—Lots of 50 tons and over. Basic, soft, up to 0·33% C, £37; basic, hard, over 0·41 up to 0·60% C, £38 2s. 6d.; acid, up to 0·25% C, £41 14s.; acid silico-manganese, £44 17s.

Alloy Steel (25 tons and over).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £46; Ni 2·75/3·75%, Cr 0·5/1·10%, £72 17s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo. 0·2/0·65%, £83 7s. BARS: 1 in. dia. and up, nickel, £66 7s.; nickel-chrome, £97 1s.; nickel-chrome-molybdenum, £109 14s.

Other Semi-products, etc.—Forging ingots, up to 0·60% C, £31 12s. 6d. f.o.t.; tube billets, 50 tons and over, £39 10s.; shell steel billets for direct forging, up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland): Soft basic, 50 tons and over £39 17s.; hard basic, 50 tons and over, £43 8s.; free-cutting, up to 0·25% C, 50 tons and over, £45; acid, up to 0·75% C, 50 tons and over, £54 6s. 6d. Stainless steel billets, 3 in. and larger, 10 tons and over, Austenitic, £219 10s.; martensitic, £131 10s.

FINISHED STEEL

Heavy Products (50 tons and over).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £40 7s.; medium plates, all areas of England and Wales, £43 16s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £42 17s.; floor plates, N.-E. Coast, £41 16s. Sections (N.-E. Coast, Midland, and Northern Joint Areas, and Central Scotland): Angles, £38 1s. 6d.; bars (rounds and squares), £40 11s. 6d.; flats, £38 6s. 6d.; joists, £37 17s. 6d.

Rolled and Re-rolled Steel Products.—N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £44 9s. 6d.; hard basic, £41 19s. 6d.; Siemens-Martin acid, £49 12s. 6d.; spring steel, basic, £44 4s. 6d. spring steel, acid, £53 11s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

Sheets and Strip.—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 11s. Cold-rolled steel strip, coils, hard temper, not annealed, 20 tons and over, £54 5s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

Tinplates.—Cold reduced, hot dipped, 15 tons to under 50 tons, 66s. 8d. per basis box of 108 lb., f.o.t., makers' works. Cold reduced electrolytic, 59s. 9d. per basis box.

Colliery Rails and Arches.—Arches, 4 in. × 2½ in. × 2 in., re-rolled, £38 15s.; 3 in. × 3 in., re-rolled, £39; 3½ in. × 3½ in., re-rolled, £40 7s. 6d.; 4 in. × 2½ in. × 2 in., prime £43 7s. 6d. Other sections, prime, £43 12s. 6d. Extra fish-plates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled, £37 9s.; 3 in. × 3 in., re-rolled, £37 11s. 6d.; 3½ in. × 3½ in., re-rolled, £38 18s. 6d.; 4 in. × 2½ in. × 2 in., prime, £42 4s. 6d. Other sections, prime, £42 7s. Benk bars, standard type, prime material, all thicknesses, £38 11s. "W" type bars, prime steel, all thicknesses, £41 1s. Standard type, re-rolled, up to ⅜ in., inclusive, £36 3s. 6d.; over ⅜ in. to ½ in., inclusive, £37 8s. 9d. "W" type bars, re-rolled, up to ⅜ in., inclusive, £38 13s. 6d.; over ⅜ in. to ½ in., inclusive, £39 18s. 6d. Light rails, flange, 25 lb. and under, prime, £40 17s. 6d. Flange rails, 25 lb. and under, re-rolled, £39 15s. Fishplates, £50 12s. 6d.

Bright Steel (50 tons and over).—Bars, no analysis or test, £53 5s.; flats, untested, £70 16s. 6d.

High-speed Tool Steel.—Finished bars,5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

Rails, etc.—F.B. rails, heavy 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s.; fishplates for rails 80 lb. and heavier, 50 tons and over, f.o.t., £55 11s.; soleplates, f.o.t., 100 tons and over, £51. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.; fishplates for light rails, 50 tons and over £50 12s. 6d.

BLAST-FURNACE COKE

(*F.O.T. at Ovens*)

DURHAM AND NORTH-EAST COAST: 177s. 6d. SOUTH WALES: 174s. 7d. NOTTS AND DERBY: 150s. 7d. LANCASHIRE: 162s. 7d. STAFFORDSHIRE: 156s. 2d. YORKSHIRE: 155s. 1d. SCOTLAND: 187s. 11d. All prices subject to quality differentials

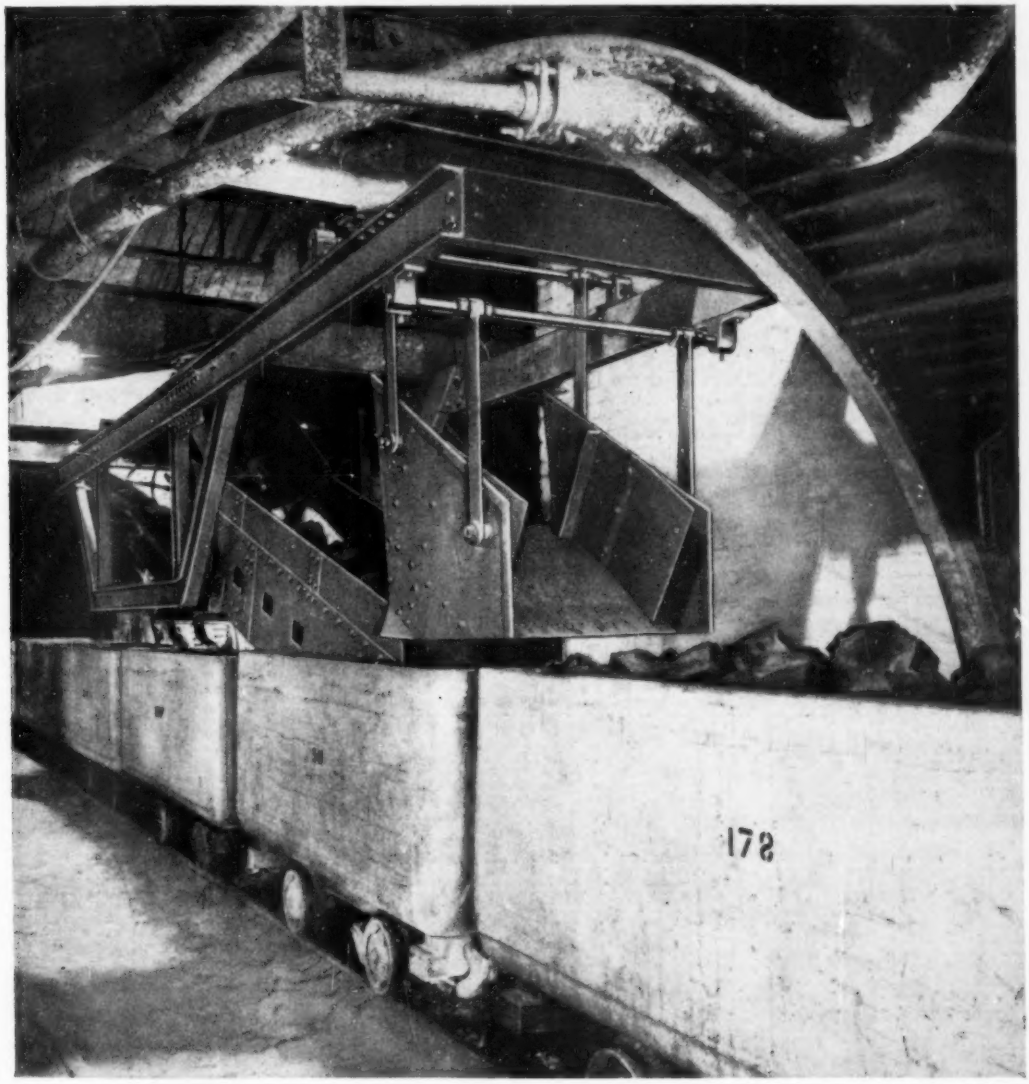
STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

	Scotland.	N.-E. Coast.	Midlands.	Sheffield.	Lancs	S. Wales (East)	S. Wales (West)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Heavy steel scrap*	229 3	228 3	220 0	226 3	226 3	227 3	232 3
Heavy mixed scrap*	207 3	206 3	198 6	204 3	203 9	205 3	210 3
Heavy steel turnings† ..	179 9	179 0	169 9	176 9	174 3	177 0	180 0
Heavy cast iron†	206 9	203 9	208 0	204 3	189 3	199 3	205 9
Cast-iron borings†	160 3	157 3	157 0	159 9	157 3	159 6	164 6

* Not less than 500 tons delivered within three months.

† Not less than 250 tons delivered within three months.



Provisionally Patented

PHOTOGRAPH BY KIND PERMISSION OF
No. 7 AREA N.E. DIV. N.C.B.

GOODALL
CLAYTON

'SHARLSTON' AUTOMATIC MINE CAR BOOM LOADER

* **Prevents Breakage at Loading Points**
* **F.L.P. Motorised Drum Drive**
* **Pneumatic or Hydraulic Automatic Lifting and Lowering**
* **Up to 450 Tons Per Hour in 3 ton cars**

Further Details on Request

GOODALL, CLAYTON & CO. LTD., PEPPER ROAD WORKS, LEEDS 10, YORKS.

CLASSIFIED ADVERTISEMENTS

PREPAID RATES: Fifteen words for 7/6 (minimum charge) and 4d. per word thereafter. Box Number 2/6 extra per insertion (including postage of replies). Situations wanted 2d. per word throughout.

Advertisements accompanied by a remittance and replies to Box Numbers should be addressed to the Advertisement Manager, Iron and Coal, John Adam House, 17/19, John Adam Street, London, W.C.2. If received by first post Tuesday, they can normally be accommodated in the next Friday's issue.

SITUATIONS VACANT

IMPERIAL CHEMICAL INDUSTRIES LIMITED
Billingham Division

have a vacancy for

AN UNDER MANAGER

to assist in supervising production operations in their Anhydrite Mine.

Candidates should be under 35 years of age and should hold a Degree in Mining Engineering and a first class Colliery Manager's Certificate of competency. They should be experienced in modern mining methods.

The appointment is pensionable and the salary offered will be commensurate with age and experience. There is a profit-sharing scheme and if the successful candidate is married, assistance can be given towards house purchase and removal expenses.

Write, giving brief details of age, qualifications and experience, quoting reference S/K.3, to:—

**The Staff Manager,
Imperial Chemical Industries Limited,
Billingham Division,
P.O. Box No. 1,
Billingham,
Co. Durham.**

MINE SURVEYOR. Young Assistant required for large Gypsum Mines. Write, stating age and qualifications, experience etc. to: THE GYPSUM MINES LTD., Mountfield, Robertsbridge, Sussex.

ASSISTANT COKE AND BY-PRODUCTS MANAGER

A VACANCY exists for an assistant coke and by-products manager with WANKIE COLLIERY COMPANY LIMITED, Southern Rhodesia.

Wankie Colliery which is situated near Bulawayo, Southern Rhodesia, produced in 1960 approximately 4,000,000 tons of coal, 188,000 tons of coke, 37,000 tons of bricks and refractories, 750,000 gallons of tar and a quantity of ammonia liquor and benzole. It is the sole supplier of coal and coke in the Federation. Profits in 1960, before taxation, were more than £1,600,000.

The assistant coke and by-products manager is a senior official and must be able to stand in for the manager. Prospects of advancement are good.

Gross starting salary will be not less than £1,700 p.a. A three-bedroomed house will be provided rent free. There are generous pension and medical aid schemes. Outward passages for the successful applicant, and his family, will be paid by the company.

Applicants should have obtained a degree or H.N.C. in Chemical Engineering, or hold an equivalent qualification. They should have had five years' experience in carbonisation and/or by-product plant operation. Experience in refractory brick production would be an additional qualification.

Applications giving age, marital status, qualifications and experience should be sent to:—

**The Appointments Officer, (G),
Wankie Colliery Company Limited,
40, Holborn Viaduct,
London, E.C.1.**

INSTALLATION/SERVICE ENGINEER required immediately. Work entails supervision of installation, start-up and servicing of vibratory and gyratory screens, slurry pumps, gyratory crushers, compacting and granulating equipment. Excellent urther opportunities for right man. Write or phone for application form to ALLIS-CHALMERS GREAT BRITAIN LIMITED, 728, Salisbury House, London Wall, London, E.C.2. Phone NATional 0821.

AUCTIONEERS AND VALUERS

HENRY BUTCHER & CO.

Specialists Auctioneers and Valuers of Plant and Machinery Factory Agents and Surveyors

Fire Loss Assessors

**73 CHANCERY LANE
LONDON, W.C.2**
Telephone: HOL. 8411 (8 lines)

MICHAEL FARADAY & PARTNERS
Established 1896
CHARTERED SURVEYORS
Valuations of Factories, Works & Plant for all purposes.
Specialists in Rating & Derating of Industrial Premises, Machinery & Plant
40, BROOK STREET, LONDON, W.1
Telephone: GROsvenor 8446 (5 lines)

AUCTIONEERS AND VALUERS —contd.

FULLER HORSEY
SONS & CASSELL

Specialists in the

SALE & VALUATION

of INDUSTRIAL PLANT & PROPERTIES of ALL TYPES

SINCE 1807

**10 LLOYD'S AVENUE
LONDON E·C·3**
TELEPHONE: ROYAL 4861
Rathbone

BUSINESS FOR SALE

BRORA COAL AND BRICK CO. LTD. (In Liquidation)

THE following are offered for sale on a going concern basis, together or separately.

(1) Small licensed coal pit and briquetting plant at Brora, Sutherlandshire. All electric underground. Output about 8,000 tons annually. At present not producing but miners available.

(2) Recently modernised brickworks at Brora, Sutherlandshire, producing red burned common and facing bricks up to 120,000 per week. Plant comprises Bradley & Craven Pan Mill, Rawdon 17-inch de-airing brick machine, Ivo cutting table and handling gear, 12 corridor Ivo dryer and 18 chamber Hoffman Kiln. Very large licenced clay deposits.

For further particulars apply to the undersigned:—

CHARLES H. O. TULLOCH,
Chartered Accountant,
Liquidator,
15 Melville Street,
Edinburgh, 3.

SERVICES OFFERED

HAULAGE WORK wanted for Tipping Lorries. "A" Licenced. Bulk coal, steel scrap. Phone Hayes Middlesex 1371.

MACHINERY FOR SALE

RAPIER 3-ton Super Diesel Electric Mobile Crane, on pneumatics.

**JOSEPH PUGSLEY & SONS, LTD.,
Bristol, 5.
Tel.: Bristol 56037.
Grams.: "Piston," Bristol.**

FOR SALE. Saddle Tank 0-4-0 Locomotives 14 in. and 15 in. in exceptionally good condition throughout at very attractive prices.
Full particulars to:—

E. G. STEELE & CO. LIMITED,
84 Dalziel Street,
Hamilton, Lanarkshire.

MACHINERY FOR SALE—*contd.*

FOR SALE.

SECONDHAND Steel Sections, Channels, Angles and Joints. Secondhand Railway Material.

THE MOTHERWELL MACHINERY & SCRAP CO., LTD.

P.O. Box No. 15, INSHAW WORKS, MOTHERWELL.

Telephone: Motherwell 4536/7/8.
Telegrams: "Scrap" Motherwell.

TWW

AIR COMPRESSORS:

ALLEY & McLELLAN 23B size 8 Two Stage Air Compressor, 750 c.f.m./100 p.s.i. Motor Driven 400/3/50.

Atlas AR3 Two Stage Air Compressors, 570 c.f.m./120 p.s.i. Motorised, 400/3/50.

Alley & McLellan 23B size 6 Two Stage Air Compressor, 500 c.f.m./100 p.s.i. Motorised 400/3/50.

C.P.T. Air Cooled Air Compressor, 475 c.f.m./100 p.s.i. Motorised 400/3/50.

Broomwade EH245 Twin Cylinder Air Compressor, 400 c.f.m./100 p.s.i. Motorised 400/3/50.

Holman TH36S Two Stage Air Compressor, 290 c.f.m/100 p.s.i. Motorised 400/3/50.

Bellis & Morcom Two Stage Air Compressor 200 c.f.m./100 p.s.i. Motorised 400/3/50.

Reavell Air Compressor 150 c.f.m./100 p.s.i. Motorised 400/3/50.

Also range of Modern Portable Diesel Engine Driven Compressors of 50/600 c.f.m./100 lb.

THOS W. WARD LTD.
ALBION WORKS · SHEFFIELD

Phone: 26311 Ext. 307.
Grams: Forward, Sheffield.

Remember - Wards might have it!

AIR COMPRESSORS for sale. 2,500 cu. ft. Belliss Morcom, 100 p.s.i., 550 h.p. motors; 2,300 c.f.m. Holland Rotary 25 p.s.i.; 525 c.f.m. Holman, 1940, 119 h.p.; 400 cu. ft. Broomwade EH245, new 1943, 90 h.p.;; 300 c.f.m. Broomwade EH240, 100 p.s.i., 60 h.p.; 250 c.f.m. Belliss Morcom, 100 p.s.i., 60 h.p. Also numerous others, and Air Receivers 1 ft. to 9 ft. dia., 100 to 1,000 lb. pressure.

LOCOS—Two Fowler 150 h.p. Diesel; 2 Barclay 80 h.p. diesel, 0-4-0; 2 Ruston 16 20 h.p. 24 in. gauge diesel; 2 Hudson 20 h.p. 24 in. gauge diesel; 4 Logan 3-4 ton 24 in. gauge, battery operated, including two flameproof.

E.O.T. CRANES—30 ton Marshall Fleming, 29 ft. 3 in. span, 480 v. D.C.; 25 ton girders and end carriages with 60 h.p. motors, 95 ft. 10 in. span; 25 ton Clyde, 21 ft. 9 in. span, new 1954; 20 ton Morris Goliath, 35 ft. span, 5 ton auxiliary; 20 ton King, 42 ft. 3 in. span, almost new; 20 ton Vaughan, unused, 42 ft. 3 in. span; 10 ton Heywood, 54 ft. span, unused; 2—10 ton, 60 ft. span, 1955; 5 ton, 37 ft. span, 1944; 5 ton King, 29 ft. 3 in. span; 4 ton Morris, 19 ft. span, 220 v. D.C.; 3 ton Morris, 149 ft. span, 4 motor, new 1954.

LOCO CRANES, STANDARD GAUGE—12½ ton Brownhoist steam, 50 ft. jib; 8 ton Wilson steam, 35 ft. jib; 5 ton Smith steam, 50 ft. jib (2); 5 ton Grafton diesel, 35 ft. jib (2); 3 ton Smith steam, 25 ft. jib.

STEEL AND CAST IRON PIPING—Most sizes, ½ in.—60 in., including 2, 3, 4 and 6 in. Victaulic, 1¼ in., 2½ in., 3 in. galvanised, 16 in., 20 in., 24 in., 26 in., 27 in. and 28 in. UNUSED BITUMEN LINED AND COATED WITH JOHNSON COUPLINGS. Special Parcels:

20,000 ft. 6 in. × 3/16 in., ¼ in., 5/16 in., unused steel seamless.

10,000 ft. 8 in. × ¼ in., unused steel seamless.

2,000 ft. 24 in. × ¼ in., unused welded and seamless.

300 × 12 ft. lengths 10 in., unused, cast iron flanged.

List on request.

FRED WATKINS (ENGINEERING) LTD.
Coleford, Glos.
Tel.: Coleford 2271/5.

TWW

0-4-0 "BARCLAY" 150 H.P. DIESEL LOCOMOTIVE, 150 h.p. "Paxman" 8-cylinder diesel engine, "Bryce-Berger" handraulic starter, "Vulcan-Sinclair" hydraulic coupling, "Wilson" 3-speed gearbox, "Westinghouse" straight air brakes, overall weight of Locomotive 22½ tons. Ready for immediate work.

THOS W. WARD LTD.
ALBION WORKS · SHEFFIELD

Phone: 26311 Ext. 225.

Remember - Wards might have it!

WANTED URGENTLY

Discarded Sacks, Slag Bags, Old Sacking.

For good prices and prompt settlement sell to actual users.

JOHN COTTON
(JUTE LTD.)
NUNBROOK MILLS
MIRFIELD · YORKSHIRE
Tel: Mirfield 3306-7

COPPER BLAST FURNACE TUYERES

REAY BRASS FOUNDRY CO. LTD. STOCKTON-ON-TEES

Telephone: 65295-6

THE HIGHEST STANDARD OF EFFICIENCY AND RELIABILITY

"WHITTAKER"
BRICKMAKING MACHINERY

Sole Makers and Patentees—

C. WHITTAKER & CO. LTD.
ACCRINGTON.

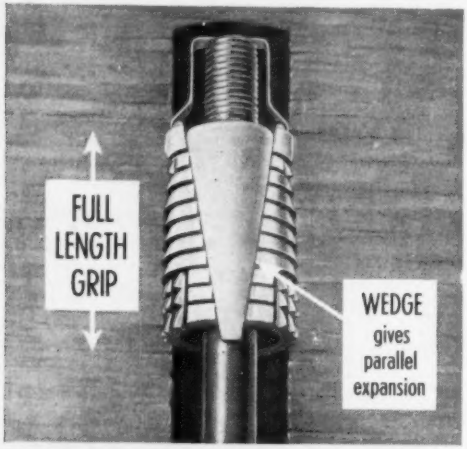
STEEL CASTINGS

For all purposes
★ **Black or Machined**

Special attention given to orders for Castings for Breakdown Work.

HORNSBY & GOODWYN LTD.
Steel Founders
SCUNTHORPE

Phone: 2231 & 2 (2 lines). Grams: Machinery SCUNTHORPE
London Office: 313 Balham High Rd., S.W.17. Tel: Balham 9855.

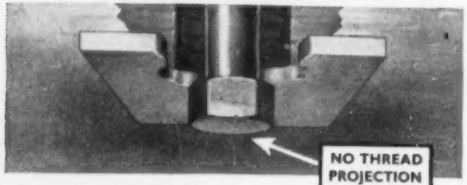


'PATTIN'

ROOF BOLTS FOR SAFETY

With their double-expanding, parallel-action shells, 'PATTIN' roof bolts are easily inserted in hard or soft strata; their superior anchorage has established them as the most widely used strata bolts in the U.S. coalfields. They can be positioned at any depth in the hole and the bolt portion is often reclaimable. FAST TO INSTALL, SIMPLE, ECONOMICAL.

EWART



Practical demonstration or literature on request

EWART CHAINBELT CO. LTD

DERBY Telephone: Derby 45451

Strata Bolt Engineer: A. CADMAN. Telephone: Goldthorpe 2303

IN CASE OF EMERGENCY

. . . and if flooding is involved, you'll need the pump that's quickest to Install—a pump capable of raising a lot of water in a little time—you'll need a Beresford Submersible Pump.

More and more Engineers are proving that these units meet their normal and emergency demands more satisfactorily than most. Both pump and motor of a Beresford Submersible are designed to do a tough job—they're robust and made of the right materials, with nothing "skimped". We use bronze and stainless steel wherever possible—it pays the user in the long run.

It's worth weighing-up the advantages of the Beresford Submersible pump—to help you, may we send further details?

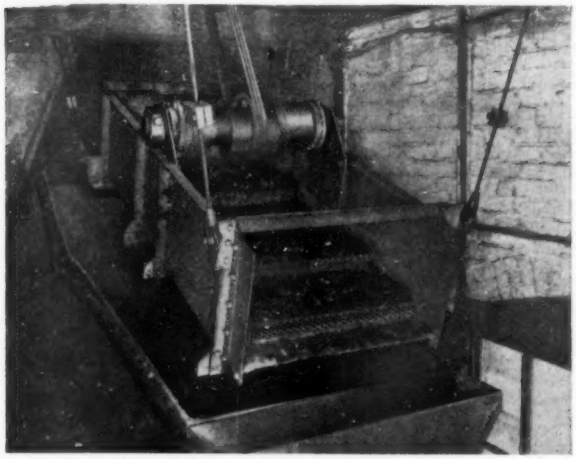
Please ask for Publication PL310.

- you can rely on

BERESFORD *submersible* PUMPS

JAMES BERESFORD AND SON LIMITED
(Members of the Cornercroft Group of Companies)
Ace Works, Kitts Green, Birmingham 33.
Telephone Stechford 3081.

J15



Photograph by courtesy of the National Coal Board

ACCO

"SUPER-CENTRIC" SCREENS

AUTOMATIC COAL CLEANING COMPANY LIMITED · DURRANHILL · CARLISLE

A SIMPLE, EFFICIENT, LARGE OUTPUT CAPACITY CLASSIFYING SCREEN

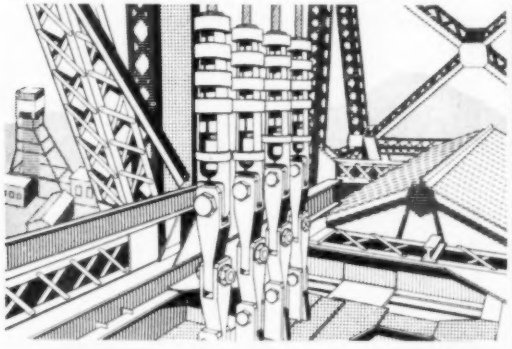
at low capital cost

The ACCO "Super-Centric" Classifying Screen is rope suspended, with a vibrating unit consisting of an out-of-balance sleeve rotating on a stationary shaft; this imparts a rotary movement to the screen. The vibrating unit is merely clamped to the screen body and can be removed in a few minutes.

- **Size of stroke can be varied as required.**
- **Variation of slope (normally 15°-20°) by adjusting the rope suspension.**
- **Drive by flat belt or V-rope direct on to the sleeve.**
- **Speed and acceleration varied by changing motor pulley.**
- **Widely applicable to all feed sizes and separations.**

Telephone: Carlisle 24391
Telegrams: ACCO, Carlisle

AC 130



"RELIANCE"

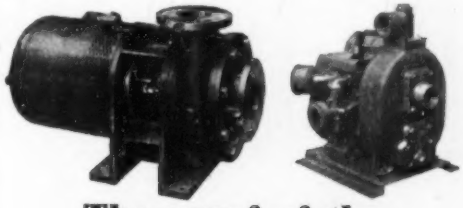
Specify "Reliance" attachments for your cage and skip winding ropes, balance ropes, haulage ropes, for the suspension and tensioning of your guide ropes, and for aerial ropeways.

Catalogues and technical literature available.

RELIANCE ROPE ATTACHMENT COMPANY LIMITED

27 PARK PLACE · CARDIFF · GT. BRITAIN

AD-10



The proof of the Pump is in its Performance

- - which is why engineers, once having installed Safrans continue to install

SAFRAN
REGISTERED TRADE MARK
PUMPS

Technical literature with performance figures on application to makers

SAUNDERS VALVE COMPANY LIMITED
SAFRAN PUMP DIVISION
DRAYTON STREET WOLVERHAMPTON

STEEL CASTINGS

Produced by Electric Arc Process and Modern Plant

For - -

Rolling Mills - Melting Plants - Engineers, etc.

★

We can supply MACHINED when required

W. SHAW & Co. Ltd.
WELLINGTON STEEL FOUNDRY
MIDDLESBROUGH

Telephone: 3441 (P.B.X.)
Telegrams: Wellington, Middlesbrough

HERBERT COTTERILL LTD.

Pinxton, Notts

WELDED STEELWORK
QUICK DELIVERIES

Telephone: PINXTON 482

BURNSIDE for BORING

Burnside's IMPROVED Safety Hydraulically-operated Boring Apparatus

ROTARY CORE RECOVERY BY CONTRACT

Extra Long Hole Boring Machines, Long Hole Boring Machines, Drilling Machines, Earth and Well Boring Tools.

GEO. BURNSIDE LTD.

Shiney Row, Houghton-le-Spring, Co. Durham, England
Telephone: 17 Fence Houses
Telegrams: Burnside Shiney Row
Established 1885

NEW AND SECOND HAND

RAILS

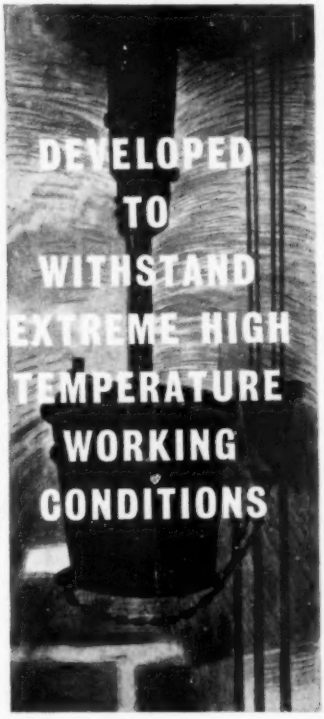
OF ALL SECTIONS
POINTS · CROSSINGS · SLEEPERS
TIMBERS · RAIL FASTENINGS · CHAIRS
PORTABLE RAILWAY AND TIP WAGONS
CHOCKWOOD
CIVIL ENGINEERING AND CONTRACTORS' SUPPLIES
S/H SAWN TIMBER A SPECIALITY

S. RHODES CO. LTD.

Telephone: 41327-9
BRIGHTSIDE LANE
SHEFFIELD 9
Telegrams: 'RODESCO' SHEFF.

DEPOTS (SHEFFIELD) MILLRACE, BROUGHTON LANE, ECCLESFIELD (LIVERPOOL) KNOTTY ASH.

"ONX" PRODUCTS



FIRE CEMENTS AND REFRACTORY CASTING MORTARS FOR ALL INDUSTRIES

Efficient construction and repair of all kinds of brickwork subjected to high temperatures has its reward in increased production and plant efficiency. A. L. Curtis (ONX) Ltd. have made a lifetime's study of heat resisting materials and the "Onx" range of fire cements and refractory casting mortars is the result of continuous development and research in our own laboratories.

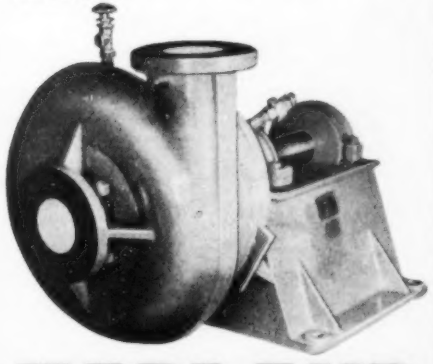
Phone: CHATTERIS 61
Grams: WESTMORLAB CHATTERIS

A. L. CURTIS (ONX) Ltd
WESTMOOR WORKS, CHATTERIS, CAMBS.

Solids in suspension . . .

or the problem of from here to there!

Although, since the advent of the Harland 'Swallowglide' there is no longer any problem. This centrifugal pump can convey *any* substance (grits, sludges, corrosives, sewage, and solids of all types) to which can be added a suitable carrying agent – cleanly, rapidly and economically. The costly days of manhandling, of buckets, shovels and troublesome conveyors have disappeared completely; so if YOU are balanced on the tightrope of decision – remember . . .



HARLAND
SWALLOWGLIDE PUMPS

THE HARLAND ENGINEERING Co. Ltd
Works: ALLOA SCOTLAND AND TIMPERLEY CHESHIRE
London and Export Sales Office: HARLAND HOUSE 20 PARK STREET LONDON W1
Branches in Bristol Glasgow Leeds Newcastle Nottingham Timperley (Cheshire) Wolverhampton and overseas

A180/6

MILLOM HEMATITE

THE WEST COAST STANDARD

Millom brand of West Coast Hematite is of unrivalled reputation.

It is "the West Coast Standard."

INGOT MOULDS

Of our usual excellent quality.

REFINED MALLEABLE PIG IRON

Cupola-cast in small pigs — is specially favoured for small malleable castings.

MILLOM MACHINE CAST PIG IRON

free from Sand and Sows.

SPECIAL CYLINDER IRONS

Particularly suitable for Cylinders, Pistons, I.C. Engine parts or other highly stressed components. Special Irons for Rolls.

ANNEALING ORES FOR MALLEABLE TRADE

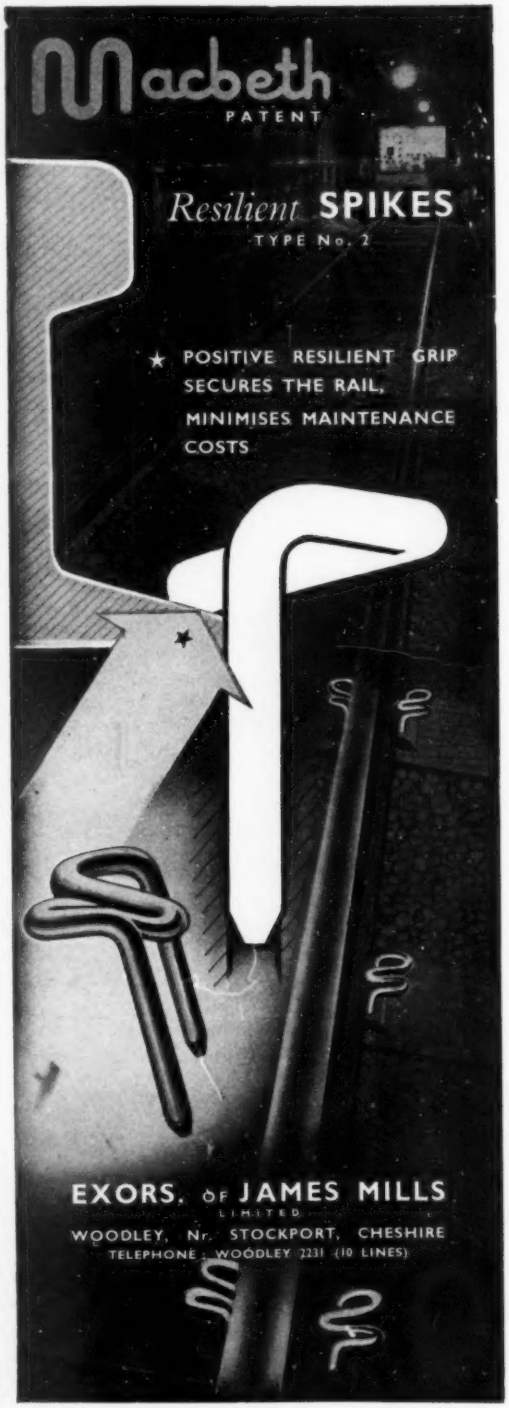
Crushed and screened to customer's requirements and entirely free from dust.

MILLOM HEMATITE ORE & IRON Co., Ltd.,

MILLOM, CUMBERLAND

Tel.:—Millom 265, 266 & 267 (3 lines)

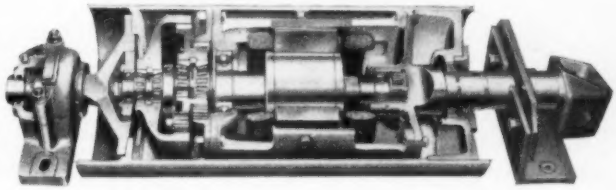
'Grams:—"Ironworks," Millom Telex No. 6561



THE DRUM WITH DRIVE

Fit Thorite

for light or arduous duty



motorised conveyor drum

fit it and forget it Easily installed · Saves space · No routine maintenance · Fractional h.p. to 20 h.p. Speeds range from 3 – 855 f.p.m. · Flameproof and sprocket models available

Please write for full details to

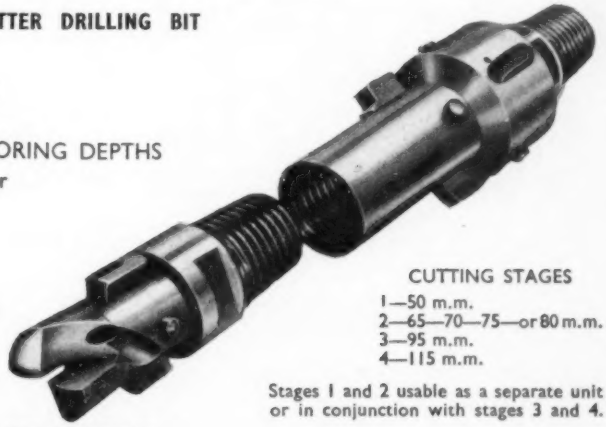
RICHARDS STRUCTURAL STEEL CO. LTD. Phoenix Iron Works, Leicester 61237

THE EDECO MULTI-STAGE FLY-CUTTER DRILLING BIT

The IDEAL BIT for

ALL OPEN HOLE DRILLING
BLAST HOLE DRILLING
DRILLING TO REQUIRED CORING DEPTHS
DRILLING FOR METHANE or WATER DRAINAGE
Equally suitable for Air or Water Flush

Reconditioning on site—change of cutters is simple.



CUTTING STAGES
1—50 m.m.
2—65—70—75—or 80 m.m.
3—95 m.m.
4—115 m.m.

Stages 1 and 2 usable as a separate unit or in conjunction with stages 3 and 4.

Screwed to suit various standard Rods.

Adaptors available for other Rods.

ENGLISH DRILLING EQUIPMENT COMPANY LTD.

PALACE CHAMBERS · BRIDGE STREET WESTMINSTER · LONDON · ENGLAND

Tel.: TRAFALGAR 5474/8 Cables: BULLWHEEL LONDON

Subsidiary Companies:

Edeco Prospectors Ltd. Lindley Moor Road Huddersfield, England

Edeco (Trinidad) Ltd. Box 27, San Fernando Trinidad, W.I.

Edeco G.M.B.H. Warburgstrasse 26 Hamburg 36, Germany

INDEX TO ADVERTISERS—*continued from page 70.*

Jenkins, W. J. & Co. Ltd. .. —
Johnson Rolls Ltd. .. .. —
Jones, W. Stanley (Engineers) Ltd. .. .. —
Joy, Sullivan Ltd. .. .. —

Kennedy, Allan & Co. Ltd. .. —
Kenyon, Wm. & Sons Ltd. .. —

Lafarge Aluminous Cement Co. Ltd. .. .. .. —
Lanarkshire Bolt Ltd. .. —
Lanarkshire Steel Co. Ltd. .. —
Lancaster & Tonge Ltd. .. —
Lane, Francis & J. S. Ltd. .. —
Ledward & Beckett Ltd. .. —
Lever, J. & Sons Ltd. .. —
Lilleshall Co. Ltd. 9
Lindley, H. Ltd. .. .. —
Locker Industries Ltd. .. —
Lodge-Cottrell Ltd. .. .. —
Lumb, Jas. & Sons Ltd. .. —
Lysaght's, Scunthorpe Works —

Mackley, E. N. & Co. Ltd. .. 26
M. & C. Switchgear Ltd. .. —
Markham & Co. Ltd. .. .. —
Marley, Wilfred Ltd. .. .. —
Marshall, Thos. & Co. (Loxley) Ltd. .. .. .. —
Martin Black & Co. (Wire Ropes) Ltd. .. .. .. —
Massey, B. & S. Ltd. .. .. —
Mastabar Mining Equipment Co. Ltd. .. .. .. —
Mather & Platt Ltd. .. .. —
Matthews & Yates Ltd. .. —
Mavor & Coulson Ltd. .. —
McClure, David Ltd. .. .. —
Merer Ltd. .. .. .. —
Mellowes & Co. Ltd. .. .. —
Metalectric Furnaces Ltd. .. —
Michael & Partners Ltd. .. —
Midgley & Son Ltd. .. .. —
Millom Hermatite Ore & Iron Co. Ltd. 66
Mills, James Exors. of .. 66
Mine Safety Appliances Co. Ltd. .. .. .. —
Mining Engineering Co. Ltd. .. —
Mitchell Ropeways Ltd. .. —
Mobil Oil Co. Ltd. 16
Mobile Lifting Services Ltd. .. —
Moler Products Ltd. .. .. —
Mond Nickel Co. Ltd. .. .. —
"Monitor" Patent Safety Devices Ltd. .. .. —
Mono Pumps Ltd. .. .. —
Moorwood, John M. Ltd. .. —
Morgan Refractories Ltd. .. —
Morris, Robert Ltd. .. .. —
Mowlem-Centraline .. .. —
Murex Welding Processes Ltd. —
Muschamp, N. J. & Co. Ltd. .. —

National Boiler & General Insurance Co. Ltd. .. .. —
National Coal Board .. —
National Industrial Fuel Efficiency Service .. .. —
Neal, R. H. & Co. Ltd. .. —
Needham Bros. & Brown Ltd. —
Nelson, W. & H. Ltd. .. .. —
New Conveyor Co. Ltd. .. —
Newell, Ernest & Co. Ltd. .. —
Newton Chambers & Co. Ltd. —
Niagara Screens & Plant Ltd. 69
Nife Batteries .. .. .. —
Nordberg Manufacturing Co. Ltd. .. .. .. —
North British Rubber Co. Ltd. —
North Eastern Marine Engineering Co. Ltd. .. .. —
Northfield Industrial Fabrications Ltd. .. .. —
Norton Harty Engineering Co. Ltd. .. .. .. —
Norton, Sir James Farmer & Co. Ltd. .. .. .. —
Nortons Tividale Ltd. .. —

Oldham & Son Ltd. .. .. —
Ormerod, Edward & Co. Ltd. —
Osborn, S. & Co. Ltd. .. —
Oughtibridge Silica Firebrick Co. Ltd. .. .. .. —

Padley & Venables Ltd. .. 29
Parkes, Timothy, & Sons Ltd. 57
Parramore, F. & Sons Ltd. .. —
Parsons, C. A. & Co. Ltd. .. —
Parsons Chain Co. Ltd. .. 45
Parsons Marine Turbine Co. —
Patterson Lamps (1953) Ltd. 6
Peebles, Bruce, & Co. Ltd. .. —
Pegson Ltd. .. .. .. —
Permutit Co. Ltd. .. .. —
P.G. Engineering Ltd. .. —
Pickford, Holland & Co. Ltd. —
Pittrail Ltd. .. .. .. —
Power-Gas Corporation Ltd. .. —
Power Gas Economy Co. .. —
Power Plant Co. Ltd. .. —
Premier Cooler & Engineering Co. Ltd. .. .. .. —
Press, Wm. & Son Ltd. .. —
Price, J. T. & Co. Ltd. .. —
Priest Furnaces Ltd. 49
Procter Bros. (Wireworks) Ltd. —
Protector Lamp & Lighting Co. Ltd. .. .. .. —
Pulsometer Eng. Co. Ltd. .. 61

Qualter Hall & Co. Ltd. .. —

Railway & General Engineering Co. Ltd. .. .. —
Raine & Co. Ltd. .. .. —
Ransomes & Marles Bearing Co. Ltd. .. .. .. —
Rapid Magnetic Ltd. .. .. —
Rawlplug Co. Ltd. .. .. —
Reavell & Co. Ltd. .. .. —
Reay Brass Foundry Co. Ltd. 61
Reid Gear Co. Ltd. .. .. —
Reliance Rope Attachment Co. Ltd. 63
Renold Chains, Ltd. .. .. —
Reside, Jas. Ltd. .. .. —
Revolvo Ltd. .. .. .. —
Reyrolle, A. & Co. Ltd. .. —
Rheolaveur General Construction Ltd. .. .. .. —
Rhodes, S. & Co. Ltd. .. 64
Rhymney Engineering Co. Ltd. —
Richards, Chas. & Sons Ltd. .. —
Richards Structural Steel Co. Ltd. 67
Richardsons Westgarth Atomic Ltd. .. .. .. —
Richardsons Westgarth (Hartlepool) Ltd. .. .. .. —
Rigley, Wm. & Sons Ltd. .. 35
Robertson, W. H. A. & Co. Ltd. 38
Robey & Co. Ltd. 11
Rocol Ltd. .. .. .. —
Rolled Steel Products (London) Ltd. .. .. .. —
Ropeways Ltd. .. .. —
Ross Engineers Ltd. 22
Round Oak Steel Works Ltd. —
Ruston & Hornsby Ltd. .. —
Ruston-Bucyrus Ltd. .. —

Sack, Maschinenfabrik, G.m.b.H. .. .. .. —
Salem-Brosius (England) Ltd. —
Saunders Valve Co. Ltd. .. 63
Sentinel (Shrewsbury) Ltd. .. —
Shaw, W. & Co. Ltd. 64
Sheen (Nottingham) Ltd. .. —
Sheepbridge Equipment Ltd. 37
Sheffield Twist Drill & Steel Co. Ltd. .. .. .. —
Sheffield Wire Rope Co. Ltd. —
Shell Mex & B.P. Ltd. 4 & 5
Siemens-Schuckert (G.B.) Ltd. —
Silvertown Rubber Co. Ltd. .. —
Simon-Carves Ltd. .. .. —
Simon, Richard & Sons Ltd. .. —
Siskol Machines Ltd. .. —
Skefko Ball Bearing Co. Ltd. —
Skiningrove Iron Co. Ltd. .. —
Smallman, Jas. W. Ltd. .. —
Smedley Bros. Ltd. .. .. —
Smith & McLean Ltd. .. —
Smith, John (Keighley) Ltd. .. —
Smith, Thos. & Son (Rodley) Ltd. .. .. .. —
South Wales Switchgear Co. Ltd. .. .. .. —
Spencer-Bonecourt-Clarkson Ltd. .. .. .. —
Standall Engineering Co. Ltd. —
Stanton Ironworks Co. Ltd. .. —
Steam & Combustion Engineering Ltd. .. .. —
Steel Co. of Wales Ltd. .. —
Steels Engineering Products Ltd. .. .. .. —
Steelway Ltd. .. .. .. —
Stein & Atkinson Ltd. .. 71
Stein, J. G. & Co. Ltd. .. 50
Stephens Silica Brick Co. Ltd. —
Stewarts and Lloyds Ltd. .. —
Stoddard, J. & Sons Ltd. .. —
Stone-Wallwork Ltd. .. .. —
Stothert & Pitt Ltd. .. .. —
Strachan & Henshaw Ltd. .. 12
Structural Painters Ltd. .. —
Sturdy Electric Co. Ltd. .. —
Summerson, Thos. & Sons Ltd. —
Sutcliffe, Richard Ltd. .. 25
Sutcliffe, Speakman & Co. Ltd. —

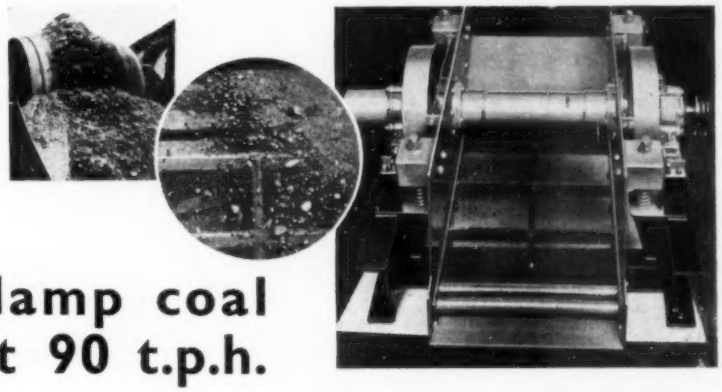
Tattersall & Sons Ltd. .. —
Taylor, F. & Sons (Manchester) Ltd. .. .. —
Tees Side Bridge & Engineering Works Ltd. .. .. —
Thermal Syndicate Ltd. .. —
Thomas (Richard) & Baldwins Ltd. .. .. .. —
Thompson, John Conveyor Co. 30
Thompson, John (Triumph Stokers) Ltd. .. .. .. —
Thompson, John, Water Tube Boilers Ltd. .. .. .. —
Thompson & Southwick Ltd. —
Thornton, B. Ltd. .. .. —
Thyssen Shaft Sinking Co. Ltd. —
Town, Fredk. & Sons Ltd. .. —
Trewella Bros. (Pty.) Ltd. .. —
Tungsten Carbide Developments Ltd. .. .. .. —
Turner Bros. Asbestos Co. Ltd. —

Underground Mining Machinery Ltd. .. .. .. —
Unifloc Ltd. 46
United Fireclay Products Ltd. —
United States Metallic Packing Co. Ltd. .. .. —
United Steel Companies Ltd. —
United Wire Works Ltd. .. —
Uskside Engineering Co. Ltd. —

Vallak, G.B. Ltd. .. .. —
Vaughan Crane Co. Ltd. .. —
Victor Products (Wallsend) Ltd. .. .. .. —
Visco Engineering Co. Ltd. .. —

Wade, Smith & Co. Ltd. .. —
Wailes Dove Bitumastic Ltd. —
Walker Bros. (Wigan) Ltd. .. —
Wallacetown Engineering Co. Ltd. .. .. .. —
Wallsend Slipway & Engineering Co. Ltd. .. .. —
Walmsleys (Wigan) Ltd. .. —
Ward, Thos. W. Ltd. .. 7
Warner & Co. Ltd. .. .. —
Wellman Bibby Co. Ltd. .. —
Wellman Smith Owen Engineering Corporation Ltd. .. 41
West Bromwich Spring Co. Ltd. —
Westinghouse Brake & Signal Co. Ltd. 27
West's (Manchester) Ltd. .. —
West's Piling & Construction Co. Ltd. .. .. .. —
Westwood, Dawes & Co. Ltd. —
Wharton Crane & Hoist Co. Ltd. .. .. .. —
Whipp & Bourne Ltd. .. —
White, R. & Sons (Engrs.) Ltd. —
Whittaker, C. & Co. Ltd. .. 61
Wickman Ltd. 19
Widnes Foundry & Engineering Co. Ltd. .. .. —
Wigglesworth, F. & Co. Ltd. —
Wild, A. G. & Co. Ltd. .. —
Wild, M. B. & Co. Ltd. .. —
Willcox, W. H. & Co. Ltd. .. —
Wincott, G. P. Ltd. .. .. —
Wombwell Foundry & Engineering Co. Ltd. .. .. —
Wood, Hugh & Co. Ltd. .. 21
Woodall-Duckham Construction Company Limited .. —
Woodhouse, Joseph Chains Ltd. .. .. .. —
Worsley-Mesnes Ironworks Ltd. —
Wragg, Thos. & Sons (Sheffield) Ltd. 31
Wright, Joseph & Co. (Fabrications) Ltd. .. .. —

Yeadon, Son & Co. Ltd. .. 8



Grading damp coal at 90 t.p.h.

That is the output of Niagara "Tenemax" Piano Wire screening surface on a 4' x 10' Niagara Screen, working on an opencast coal site. It is handling 1" down material, which is often very wet. It is significant of the singular efficiency of the "Tenemax" surface that it is dealing with the work of three screens of the same size, fitted with ordinary elongated aperture surfaces. Each wire of a "Tenemax" surface is separately tensioned on a specially designed board at the end of the screening surface. That makes wire replacement quick, easy and cheap, should a wire break. Consider the very much higher output that a "Tenemax" surface will give you and then remember that it is achieved with material that is normally difficult to screen. The figures given here prove the profit that lies in "Tenemax" for you. It can more than double your output.

Telephone: ENField 6622.

NIAGARA SCREENS & PLANT LIMITED

Straysfield Road, Clay Hill, Enfield, Middlesex

Non-Ferrous Castings

OF ALL KINDS

CHILLED CAST PHOSPHOR BRONZE

●

ELLIS *Patent* HOSE COUPLINGS

(All Sizes) and Air line fittings

STOCKISTS OF BRASS ROD AND SHEETS ETC.

HIGH-CLASS STEAM FITTINGS AND BOILER MOUNTINGS

Machining Capacity available to Customers' requirements

ALFRED ELLIS & SONS (WAKEFIELD) LTD.

CROWN WORKS · KIRKGATE · WAKEFIELD

ESTABLISHED 1850 · TELEPHONE 3360

INDEX TO ADVERTISERS

Adamson Alliance Co. Ltd. .. 43
Aerex Ltd. .. .. —
Allen, Edgar & Co. Ltd. .. —
Allen West & Co. Ltd. .. —
Allis-Chalmers (Great Britain) Ltd. .. .. —
Anchor Chain Co. Ltd. .. .. —
Anderson, Boyes & Co. Ltd. .. 1
Angus, Geo. & Co. Ltd. .. —
Appleby-Frodingham Steel Co. .. .. —
Armstrong-Whitworth (Metal Industries) Ltd. .. .. —
Armytage & Sons Ltd. .. .. —
Arrol, Sir Wm. & Co. Ltd. .. —
Ashmore, Benson, Pease & Co. Ltd. .. .. —
Ashworth, E. & A. Ltd. .. .. —
Associated British Machine Tool Makers Ltd. .. .. —
Associated Electrical Industries Ltd. (Electronic Apparatus Division) .. —
Associated Electrical Industries Ltd. (Heavy Plant Division) .. .. .. —
Associated Electrical Industries Ltd. (Instrumentation Division) .. .. .. —
Associated Electrical Industries Ltd. (Motor & Control Gear Division) .. .. —
Associated Electrical Industries Ltd. (Switchgear Division) .. .. .. —
Associated Electrical Industries Ltd. (Traction Division) —
Associated Electrical Industries Ltd. (Transformer Division) .. .. .. —
Associated Electrical Industries Ltd. (Turbine Generator Division) .. .. —
Atlas Copco (G.B.) Ltd. .. —
Aurora Gearing Co. (Wilmot North) Ltd. .. .. .. —
Austin, Jas. & Sons (Dewsbury) Ltd. .. .. —
Auto-Klean Strainers Ltd. .. 55
Automatic Coal Cleaning Co. Ltd. 63
Aveling-Barford Ltd. .. .. —

Bagnall, W. G. Ltd. .. .. —
Bairds & Scottish Steel Ltd. .. —
Barker, Davies & Co. .. .. —
Barlow & Chidlaw Ltd. .. .. —
Barnes & Bell Ltd. .. .. .. —
Barrow Ironworks Ltd. .. .. —
Bathgate, Richard A. .. .. —
Bayliss, Jones & Bayliss Ltd. —
Beckett & Anderson Ltd. .. —
Becorit (G.B.) Ltd. .. .. —
Beldam Asbestos Co. Ltd. .. —
Belliss & Morcom Ltd. .. .. —
Belmos Co. Ltd. .. .. .. —
Beresford, Jas. & Son Ltd. .. 62
Birkett, Billington & Newton Ltd. 53
Birlec-Efco (Melting) Ltd. .. —
Birtley Engineering Ltd. .. 15
Blacks Mining Equipment .. —
Blandford-Gee Cementation Co. Ltd. .. .. —
Blantyre Engineering Co. Ltd. —
Bolton Gate Co. Ltd. .. .. —
Bonser Tristram Ltd. .. .. —
Boyles Bros. Drilling Co. Ltd. 17
Bradley, J. & Co. (Stourbridge) Ltd. .. .. —
Bradley Pulveriser Co. Ltd. .. —
B.R.D. Co. Ltd. 42
Brightside Foundry & Engineering Co. Ltd. .. .. —
British Belting & Asbestos Co. Ltd. .. .. .. —
British Electrical Repairs Ltd. —
British Iron and Steel Federation .. .. —
British Jeffrey Diamond Ltd. —
British Nylon Spinners Ltd. .. —
British Oxygen Co. Ltd. .. —
British Paints Ltd. .. .. .. —
British Resistor Co. Ltd. .. —
British Rollmakers Corporation Ltd. .. .. .. —
British Ropeway Engineering Co. Ltd. .. .. .. —
British Steam Specialties Ltd. —
British Timken Division of the Timken Roller Bearing Co. 72
Broadbent, Thos. & Sons Ltd. —
Brown, David Corporation (Sales) Ltd. .. .. —
Brush Electrical Engineering Co. Ltd. 18
Brymbo Steel Works Ltd. .. —
B.T.R. Industries Ltd. .. .. —
Buell Ltd. .. .. —
Burnand, W. E. & Son Ltd. .. —
Burnside, George Ltd. .. 64
Burtonwood Eng'g. Co. Ltd. .. —
Bushing Co. Ltd. .. .. —

Cable Belt Ltd. .. .. .. —
Calomax (Engineers) Ltd. .. —
Carblox Ltd. 36
Cascade Water Coolers Ltd. .. —
Case, J. I. Co. Ltd. .. .. —
Cast Basalt Products Ltd. .. —
Ceag Ltd. .. .. —
Chloride Batteries Ltd. .. —
Churchill Machine Tool Co. Ltd. —
Clarke, Chapman & Co. Ltd. .. —
Clark, Geo. & North Eastern Marine (Sunderland) Ltd. .. —
Clayton Equipment Co. Ltd. .. —
Cleveland Bridge & Engineering Co. Ltd. .. .. —
Cohen Bros. (Electrical) Ltd. —
Cohen, Geo. Sons & Co. Ltd. —
Colvilles Ltd. .. .. —
Conflow Ltd. .. .. —
Consett Iron Co. Ltd. .. .. —
Consolidated Pneumatic Tool Co. Ltd. 28
Cooke, Troughton & Simms Ltd. —
Cooper, Jas. Milne & Co. Ltd. —
Cooper Roller Bearings Co. Ltd. —
Coppee Co. (Gt. Britain) Ltd. —
Cotterill, Herbert Ltd. .. 64
Coulson, M. & Co. Ltd. .. .. —
Courtaulds Ltd. .. .. .. —
Cowlishaw, Walker & Co. Ltd. —
Cox & Danks Ltd. .. .. .. —
Crawley Industrial Products Ltd. .. .. .. 32 & 33
Cripps, R. & Co. Ltd. .. 34
Croda Ltd. .. .. —
Crofts (Engineers) Ltd. .. .. —
Crompton Parkinson Ltd. .. —
Crowe & Taylor Ltd. .. .. —
Crushing, Screening & Engineering Ltd. .. .. —
Curtis, A. L. (Onx) Ltd. .. 65

Davenport Engineering Co. Ltd. .. .. —
Davey, Paxman & Co. Ltd. .. —
Davis, John & Son (Derby) Ltd. .. .. —
Davy & United Engineering Co. Ltd. 2
Davy & United Roll Foundry Ltd. .. .. —
Dawson & Downie Ltd. .. —
Demag A.G. .. .. —
Demolition & Construction Co. Ltd. .. .. .. —
Denison, Samuel & Sons Ltd. —
Distington Engineering Co. Ltd. .. .. —
D.M.M. (Machinery) Ltd. .. —
Dobson, W. E. & F. Ltd. .. —
Dollery & Palmer Ltd. .. —
Donkin, Bryan Co. Ltd. .. 24
Dorman Long & Co. Ltd. .. —
Dougall, James & Sons Ltd. .. 57
Dowty Mining Equipment Ltd. —
Dunlop Rubber Co. Ltd. .. —

Eagre Construction Co. Ltd. .. —
Edge & Sons Ltd. .. .. —
Eickoff, Gebr. .. .. .. —
Eimco (Gt. Britain) Ltd. .. —
Elastic Rail Spike Co. Ltd. .. —
Elcordia Ltd. .. .. .. —
Electrical Development Association .. .. —
Electric Furnace Co. Ltd. .. —
Electro-Hydraulics Ltd. .. —
Ellis, A. & Sons (Wakefield) Ltd. 69
Engineering, Marine, Welding & Nuclear Energy Exhibition .. .. —
English Drilling Equipment Co. Ltd. 67
English Electric Co. Ltd. .. —
English Steel Corporation Ltd. —
Evans, Joseph & Sons (Wolverhampton) Ltd. .. .. —
Ewart Chainbelt Co. Ltd. .. 62

Fearnehough, W. Ltd. .. —
Felco Hoists Ltd. .. .. —
Fenner, J. H. & Co. Ltd. .. —
Fielding & Platt Ltd. .. 44
Finlay Engineering Co. Ltd. .. —
Firth, Thos. & John Brown Ltd. —
Firth-Vickers Stainless Steels Ltd. .. .. —
Fisher & Ludlow Ltd. .. .. —
Flame Hardeners Ltd. .. .. —
Follsain-Wycliffe Foundries Ltd. .. .. —
Foraky Boring & Shaft Sinking Co. Ltd. .. .. —
Forster, T. S. & Sons Ltd. .. —
Foster, H. Johnson, Ltd. .. —
Foster, Henry & Co. Ltd. .. —
Foundry Services Ltd. .. .. —
Fowler, John & Co. (Leeds) Ltd. .. .. —
Fuel & Metallurgical Processes Ltd. 47
Fullerton, Hodgart & Barclay Ltd. .. .. —

Gas Council .. .. —
General Electric Co. Ltd. .. 14
General Refractories Ltd. .. —
Gent & Co. Ltd. .. .. .. —
Gibbons Bros. Ltd. .. .. —
Gibbons (Dudley) Ltd. .. .. —
Glover Bros. (Mossley) Ltd. .. 39
Glover, Wm. Jas. & Co. Ltd. .. —
Goodall, Clayton & Co. Ltd. .. 59
Goodyear Tyre & Rubber Co. Ltd. 52
Green, E. & Sons Ltd. .. .. —
Green, Horace, & Co. Ltd. .. —
Greening, N. & Sons Ltd. .. 10
Guest, Keen Iron & Steel Works 48
Gullick Ltd. .. .. —
Gutehoffnungshutte Sterkrade —

Hackbridge & Hewittic Electric Co. Ltd. .. .. —
Hadfields Ltd. .. .. .. —
Halesowen Steel Co. Ltd. .. —
Hall Bros. (West Bromwich) Ltd. .. .. —
Hallamshire Steel Co. Ltd. .. —
Hanmade Conveyor Co. Ltd. .. —
Hardman, E. Son & Co. Ltd. .. —
Harland Engineering Co. Ltd. 65
Harlow, Robt. & Son Ltd. .. —
Harvey, G. A. & Co.(Ldn.) Ltd. 13
Hastie, Bernard & Co. Ltd. .. —
Hatchett & Co. Ltd. .. .. —
Hayden-Nilos Ltd. .. .. —
Head, Wrightson & Co. Ltd. .. —
Head, Wrightson Minerals Engineering Ltd. .. .. —
Head, Wrightson Machine Co. Ltd. .. .. —
Head, Wrightson Teesdale Ltd. .. .. —
Heap, Joshua & Co. Ltd. .. 8
Heeley (Mining Machinery) Co. Ltd. .. .. .. —
Hick, Hargreaves & Co. Ltd. .. —
Hill, Richard Ltd. .. .. .. —
Hills (West Bromwich) Ltd. .. —
Holman Bros. Ltd. .. .. .. —
Holmes, W. C. & Co. Ltd. .. 3
Holroyd, John & Co. Ltd. .. —
Honeywell Controls Ltd. .. —
Hopkinson, A. & Co. Ltd. .. —
Hornsby & Goodwyn Ltd. .. 61
Hoy, Austin & Co. Ltd. .. 23
Hudswell, Clarke & Co. Ltd. .. —
Humber Graving Dock and Engineering Co. Ltd. .. —
Hunslet Engine Co. Ltd. .. —
Huntington, Heberlein & Co. Ltd. .. .. —

Imperial Chemical Industries Ltd. .. .. —
Incandescent Heat Co. Ltd. .. —
International Combustion Products Ltd. .. .. —
International Construction Co. Ltd. 20
International Harvester Co. of Great Britain Ltd. .. —
Intrafor Mining Engineers Ltd. .. .. —

(Continued on page 68)

Published by the Proprietors, INDUSTRIAL NEWSPAPERS (FUEL & METALLURGICAL), LIMITED, John Adam House, 17/19, John Adam Street, London, W.C.2, and Printed in Great Britain by HARRISON & SONS, LIMITED, by Appointment to Her Majesty The Queen, Printers, London, Hayes (Middx) and High Wycombe.

In Europe

the Reining Hot-Cooling System

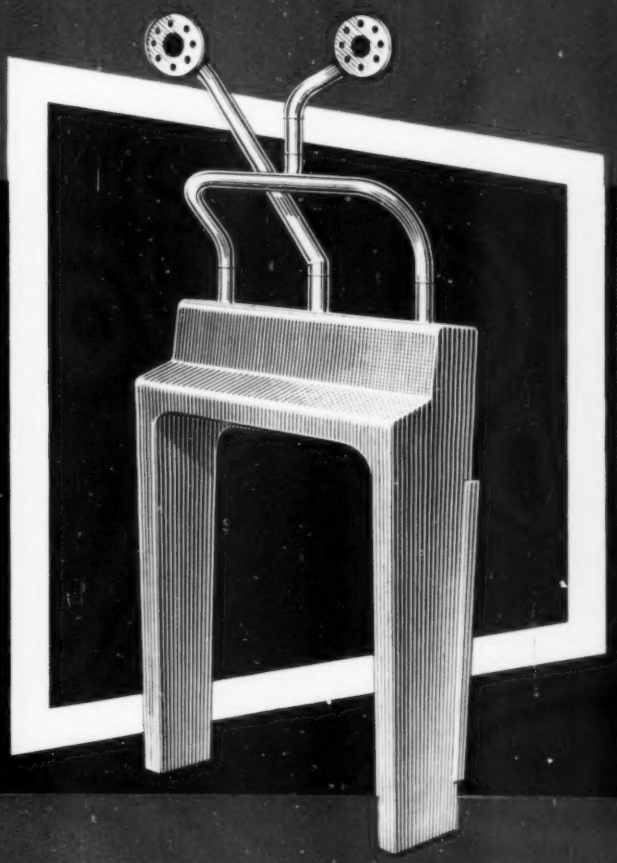
—available in Great Britain and the Commonwealth exclusively through

S&A—

has been

preferred for 75% of all new installations

Illustrated is a typical Reining Door Frame, designed specifically for Open Hearth Furnace applications. This frame produces approximately 2,000 lb. steam/hour at pressures up to 800 lb./sq. in.
The capital outlay for a complete Reining plant can be recovered in one year.



Reining pioneering and twelve years' steady development have evolved the world's foremost system of evaporative cooling. Here are some of the design features that have influenced Europe's major furnace operators to choose Reining.

1. A frame of unique design, of heavy plate construction throughout.
2. Water passages of patented design.
3. A cooling system that eliminates hot spots.
4. Adaptability to all types of door opening.
5. Suitability for all pressure requirements.

Stein & Atkinson Ltd.

Westminster House Kew Road Richmond Surrey

FURNACE ENGINEERS

IRON & COAL

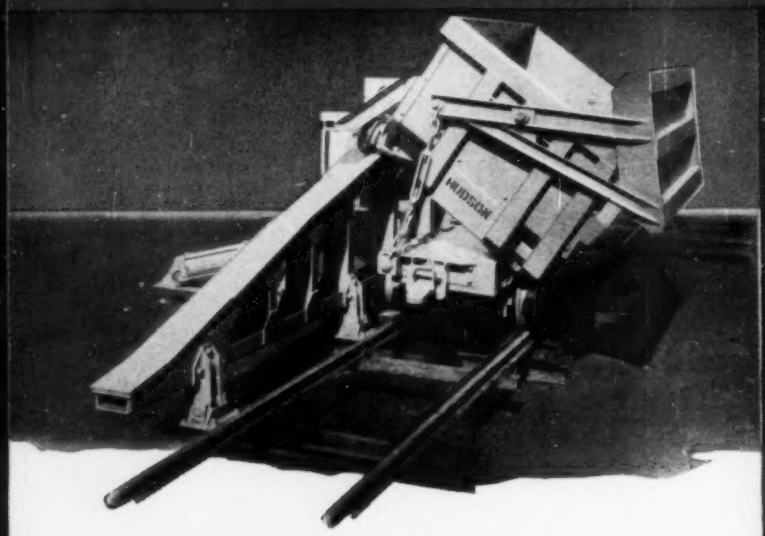
THE IRON AND COAL TRADES' REVIEW

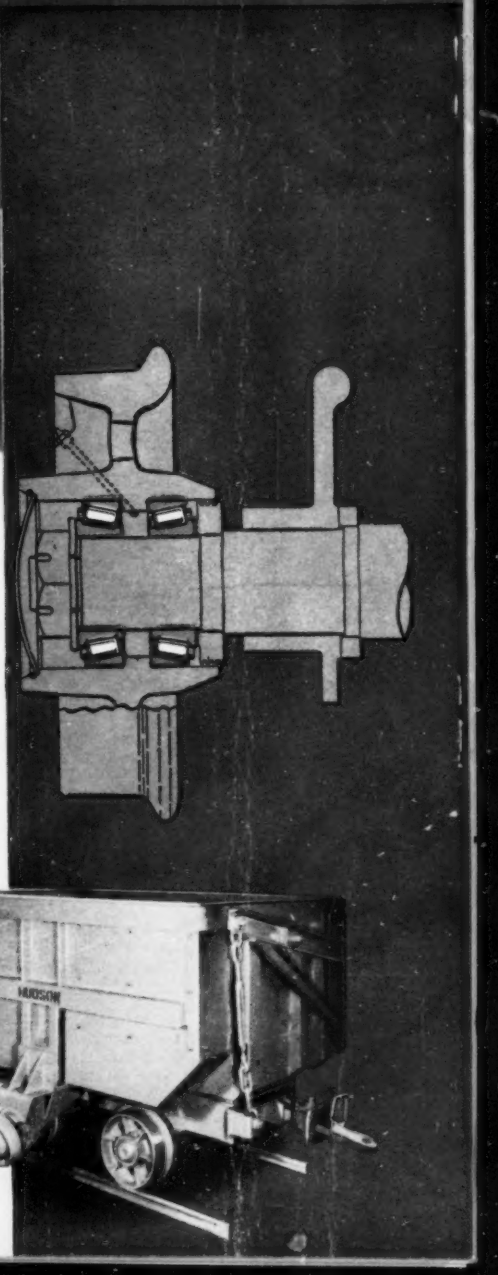
VOL. 183 No. 4,851

Offices: John Adam House, 17/19, John Adam Street, London, W.C.2

LONDON: FRIDAY, JULY 3, 1981

Registered as a Newspaper. Single copies 1s. By post 1/4. Ann. Subn.: 62s. (Abroad 68s.)





SELF-DUMPING MINE CARS

The Granby mine cars, made by Robert Hudson Limited of Leeds, are of rugged construction to withstand the hard service to which they are subjected. Recent types supplied to Canadian uranium mines include the 60 cu. ft. capacity type shown here: this car has a tare weight of approximately 2 tons and a designed capacity of about 3 tons. Rubber suspension springs are provided.

The spherically-contoured wheel, visible on the left of the truck, engages a ramp and tips the truck whilst in motion. Furthermore, as shown in the illustration, the ramp can be retracted when tipping is not required. This wheel and all the track wheels of the 60 cu. ft. and 140 cu. ft. Granby trucks are mounted upon Timken bearings.

British Timken, Duston, Northampton, Division of The Timken Roller Bearing Company. Timken bearings manufactured in England, Australia, Brazil, Canada, France and U.S.A.

TIMKEN®

REGISTERED TRADE MARK

tapered roller bearings